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A&B COMPUTING

Volume Five Number Nine September 1988

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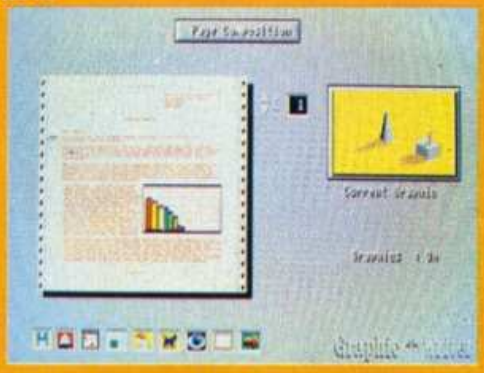

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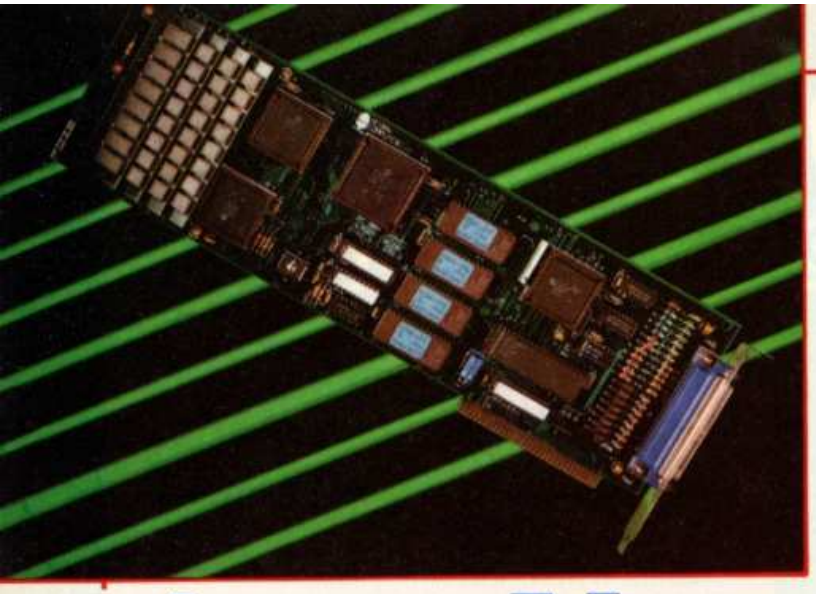

Acorn News

PBM Makes Good – At Last

When I was at college, there was a joke circulated around the role playing games societies, it went something like this:

1st student – "Wow, am I broke – I need some cash man, real fast!"

2nd student – "I know, let's start a PBM!"

A PBM is, in fact, an acronym for *Play By Mail* and the basic idea was to pay a subscription to the game, and you received a grotty map (photocopied on A3) and a hastily scribbled "manual".

That's if you were lucky!

Sometimes PBMs were nothing but a excuse to make some money quickly, you sent off your hard earned dough and waited... and waited... and waited some more. You never receive anything, the address you wrote to is very often on the other side of the country and I must admit that I have been ripped off by dodgy PBM "groups" in the past.

Before I get all self righteous, I must admit that I ran a grotty old BBC B based PBM system once so that I could afford to eat anything other than pre-stale cheese bars at college – but those times are long gone.

Now things have gone professional

Dark Blades looks good, plays good and you certainly feel as if you are getting good value for money. Once you send off your membership fee, you receive a properly printed A3 map, a manual (nicely printed in colour) and a decent quantity of hex movement paper. The rest is access to a 100 player computer-moderated role playing game – which is massive by all but the largest of the American PBM games.

Why is this in A&B? Because ex-games writer Stuart Green has created this little gem. Although running on an ST the thing takes "a bloody lifetime" certainly the prospect of using a 1 megabyte Archimedes to replace the Atari 1040 ST has been looked into – and, to be honest, he had better upgrade and re-write his software (not difficult as it is in C) soon when I tell you about the darling little prize at the end of the PBM – "Hacker – the Golden Dragon" worth some £1000

● Contact: Standard Games PBM at: Arion House, Station Road, King's Langley, Herts, WD4 8LF. ☎ (09277) 68328/9/0.

Where Have All The ARMs Gone?

Unusual developments over at the Acorn stable at the moment – they have just released a card which lets ordinary PCs directly drive a dumb laser printer without the usual "hoo hah" of running configuration software and memory boards to act as a buffer.

Based on Acorn's OEM version of the ARM processor, Acorn have essentially supplied half a million pound's worth of cards to be initially incorporated into the Olivetti ETV range of laser printers.

Harvey Coleman – Acorn's MD told me that the board consisted of the Acorn ARM, VIDc and MEMc and was essentially designed as an OEM product that was taken aboard by Olivetti to counter the stupid bottlenecks companies such as Atari and Apple have got themselves into when relying on general processor technology *inside the laser engine* that far outweighs the performance of the computers running the printer!

Up until now (so Acorn tell me), laser printers have been unable to work consistently at their maximum speed because the controller selected has been unable to provide information fast enough. The four chips that Acorn has designed, overcomes this problem and allows the printer to deliver complete pages of laser printed text and/or graphics at around 8 to 10 sheets a minute with no speed overheads for graphics *et al*.

Just look at the speed of an Atari Mega ST trying to print a graphics and text page on their own laser printer if you want a laugh.

Understandably Acorn are quite cagey about the number of boards sold to Olivetti, but figures around the 700 mark are being whispered in the lower echelons, but that leaves another 9000 OEM units unaccounted for floating between Acorn and VTI.

Keep it up lads – at this rate, you might make a profit next year.

The Wizard Strikes Back

Cambridgeshire Software House has just released a new adventure game aimed at children between 7 and 9. Running on all BBC Micros, this package is a follow up of "The Princess and the Ring" (as featured in July 1988's A&B) – don't worry, we're already working on a review of the package.

Also from CSH is **P.M.S – a first spreadsheet** running on the Master 128 and Compact, this package attempts to introduce the basics of setting up, and running a spreadsheet.

No prices as yet, but if you want to contact CSH at the address below, I am sure they will oblige.

● Contact: Cambridge Software House Ltd, The Town Hall, St Ives, Huntingdon, Cambs, PE17 4AL. ☎ (0480) 66805.

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AB 9

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PROGRAMS : Utilities

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This is just a small sample of the items featured in Volume 6

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Acorn Acquire New Henchman (again)

In a move that, to be honest, really surprised no-one, the directors of Acorn Computer Group (where the hell did "Group" crop up from?) elected **Mr Elserino Piol** to be the new chairman – he succeeds Bruno Soggiu who still remains on board.

Elserino Piol is, or should I say *was* Olivetti's executive Vice President for strategy and development. He was appointed as a Director of Acorn as long ago as March 1985 and Acorn tell me that "this underlines Olivetti's commitment to Acorn and their growing confidence in their product range".

In non-Acornspeak this move can be considered to be the next stage in Olivetti's attempts to use Acorn as a technical R&D station out here in the nether-regions of Europe.

On a more optimistic note, Bruno's reputation as a hard worker and a good eye for the numbers at the bottom of the page turned Acorn's loss making year into something quite rosy – he got Acorn past a rather nasty year (1987), and now it is time to appoint a chairman who knows more about the fickle computer market and the technology Olivetti can shove down the throats of the British computer buying public.

In short we are going to see some pretty radical moves in the near future, more aggressive marketing probably being one of them.

Good luck chaps.

DRAM Buy Peartree

Peartree Computers – the company who went into receivership at the end of May have finally been acquired by the Stockport based Dram Electronics group of companies.

Dram, reported to have paid a six-figure sum for Peartree and (one assumes) the debts they incurred, see the acquisition as a major step, others see it as a chance to see their bills paid.

The MD of Dram Electronics blurted out the usual sort of thing you would expect to hear managing directors say after they have just acquired a company, words about confidence in the fallen company; more interesting is the fact that Dram have seen Peartree's former leader, Vartan Mundigian, a suitable management position in the new venture called Peartree Dram.

From a company that calls Peartree's PC clone "exciting", I feel they may have bit off a bit more than they can chew. Oh well, time will tell . . .

Pocket Sized Modem For Z88

This one will get my Editor drooling:

The much talked about portable modem from Cambridge Computer has become available at last for the Z88 – the portable computer Acorn never made – enabling the Z88 to be hooked up to the telephone line and consequently lots of on-line services (not to mention your Beeb at home!)

The modem weighs only 130 grammes and is the size of a cigarette packet, it is battery powered and includes variable baud rates, varying protocols, auto dial and auto answer and someone whispered in my ear that it is Hayes compatible as well!

The package comes as a ROM cartridge for the Z88 (although you can move this into RAM if you want) and all necessary connecting leads.

Purchasers of the package receive a free registration and telex validation on Microlink and a month's free connection to Microlink/Telecom Gold mailbox facilities as well.

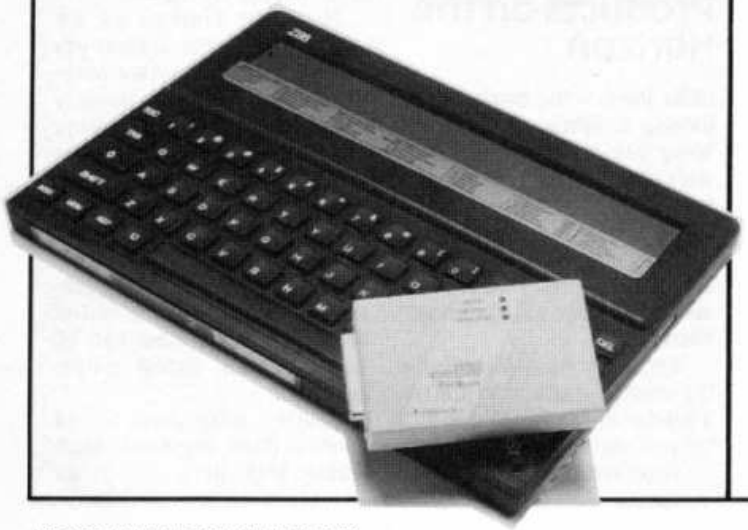
For the techies amongst you, the modem will support 300 and 1200 full duplex, Bell 103/212a and CCITT V.21/V.22 comms protocols and can be switched between the two enabling international calls without having to go through PSS or a PAD.

Auto dial on both pulse and tone systems is supported, as is a phone monitoring system.

I could go on forever about this neat little wonder but I will leave that to David Janda – our comms columnist – in a future issue.

The modem will cost around £149.95 and is available now.

● Contact: Cambridge Computer Ltd, Bridge House, 10 Bridge Street, Cambridge, CB2 1UE. ☎ (0223) 312216.



Brother Produce Portable WP

Look at this ugly little beast – horrible isn't it?

This, ladies and gentlemen, is what Brother have to offer when it comes to portable wordprocessing. Essentially a printer with a screen and a disc drive shoved on at the last minute, this printer, sorry *portable wordprocessor*, weighs in at a hefty 14Kg, a miserly 120K of memory and a 5" × 9" high resolution screen.

The WP-1 (as it is called) looks and feels as if it is nearly two years too late, weighs like it is nearly a year out of date, and is priced weigh (ho ho) out of the competition – after all, you can buy a Cambridge Z88 with 128K of RAM, a portable printer (Diconix or Epson) and *still* have change of an extra RAM pack of three.

At £650 plus VAT, Brother are going to have a bit of a shock aren't they?

Still, it prints pretty good.

Instant Shorthand – It can be done

There are very few occasions that really get me excited – fewer still that can be considered to be useful or particularly self-fulfilling, but *Instant Shorthand* from Dico Education International has, in the space of three months, quite literally changed my way of working.

The package arrived – in an unassuming little package with a disc and two manuals, I immediately fought the urge to send the package out to our educational experts and decide that it was high time I taught myself shorthand – you know, the language *real* journalists use as opposed to "Gracehand" my very own and rather lacking substitute based (as usual) around phonetic and symbol spelling (it is also unreadable – Ed).

The lessons are structured around forty five different "units" and they are all based around a series of short stories that start off as very simple sentences being represented as shorthand on the right hand page, and plain English on the left hand page.

The version of shorthand is called Teeline – an accepted and approved shorthand standard – and the method of teaching is ideally suited to self-eduction, revision, business or pleasure. Gone are the usual "failing to meet the grade" tests (that made me give up shorthand whilst I was at school) and in its place are helpful and friendly tests that can be introduced to all ages of shorthand students.

On the train going to and from work, and every now and then at lunch, I have sat flipping through this package and taught myself something I thought could never be done – okay, so I am still quite slow at translating sentences into shorthand, but I am getting faster, and I have Dico to thank for showing me a package that you really ought to try if you want to have a head start in work (or even journalism). The filofax may need to have some lines drawn in on the diary pages, but it is a more compact form of writing and, to be quite honest, a much better way of jotting down something if you are in a hurry.

The main package also doubles as a Typing Tutor. It uses a BBC Micro and, keeping things fairly close to home, I tried this package out on a secretary of some 20 years standing, a proficient touch and audio typist in the legal profession and was immediately drawn to the similar structuring of the package, easy to follow, fun (!) to learn and quite revolutionary in the way that the package is presented.

Okay, like many of my colleagues I have a few despicable typing habits (you're telling me! – Ed), so I tried the package out on a few students learning the touch typing skills for their summer vacation and they were bowled over by the simple, yet easy way the package was integrated into *their own* study routine – a few notes were made of Dico's name and address and the word is spread – yet again.

The cost of teaching yourself shorthand is £4.95, and is a companion BBC Micro disc for £25. The *Instant Touch Typing* set cost £25 for the disc and the book.

The training doesn't just stop there though, *Typing for RSA Examinations* and *Computer Keyboard Mastery* documents also exist – they are available in W.H. Smiths (BBC Micro discs included), or you could also obtain them from the source.

● Contact: Dico Education International, 247 Court Road, Eltham, London SE9 4TQ. ☎ 01 857 1943.

Doom revisited (from Topologika)

A new Adventure game landed on Darrin's desk the other day – called *Return to Doom* this game will probably get the old Acorn diehards going as they will no doubt remember the original game *Countdown To Doom* – probably one of Acorn's first adventures next to Sphinx Adventure.

Peter Killworth, the author of the original Countdown to Doom finally wrote the follow-up game, and it marks the middle of the Doom Trilogy (when the hell did it become a trilogy?) and, most interesting is the fact that the adventure also works on the humble old Electron – but it still keeps the purists happy as it is still just a text–only game.

● Contact: Topologika, PO Box 39, Stilton, Peterborough, PE7 3RL. ☎ (0733) 244682.

Master 512 Keyboard Upgrade

Users of the Master 512 co-processor running on the BBC B will no doubt gripe about the fact that there is no provision for using a numeric keypad on their machines – which is, after all, one of the most important parts of the IBM keyboard especially when you are using software that requires a great deal of numeric data entry such as Lotus 1-2-3 or Dbase II.

A company under the name of PSD (Programmable Systems Design) are offering a suitable upgrade, enabling users to access the "insert" and the "del" keys, the page scrolling functions and the additional symbols and such *in software alone*, that is, with no additional hardware keyboard links – the commands are implemented at ASCII and IBM code level to provide Master compatibility (should you want this facility on the Master 512).

In order to get "fixed" (unfortunate terminology, but their words not mine), simply send off your DOS Plus disc along with a cheque for £15, the disc will be upgraded and returned with all the necessary documentation within 14 days.

● Contact: PSD at 20 Beechwood Road, Easton in Gardania, Avon, BS20 0NA. ☎ (027) 581 3570.

New DABs Products on the Horizon

DABs Press – the company fast gaining a rightful reputation as being one of *the* premier software and documentation vendors for the BBC and Acorn market have, after a few month's well-deserved rest, come back with a deluge of new software products and manuals/guides of the BBC Micro.

One of the most interesting of the latest products is *MiniDriver*, a printer driver facility for Mini Office II users.

There are five Mini Offices as runners-up prizes in this month's competition, but I digress . . .

MiniDriver provides all the usual printer driver support you would expect from such a package, and looking alarmingly similar to their earlier package *HyperDriver*, this package works with all Epson compatible printers and works iith *all* versions of Mini Office II.

Compatible with all BBC B's, Masters, Compacts – this package looks set to do the sort of thing View users have had all along – offer decent printer support.

● Contact: DABs press at: 76 Gardiner Road, Prestwich, Manchester, M25 7HU.

Craig Rich in the midst of girls from Wadebridge Junior and Infant Girls School with their Archimedes – a prize donated by Acorn Computers for their Safety In The Home theme.

Mirrorsoft reduce DTP package prices

A very nice deal being set up by Mirrorsoft is the introduction of a special "reduced rate" for their DTP packages, Fleet Street Editor and their various support discs.

Offer 1 consists of Fleet Street Editor and any one of their add-on packages including *Fonts "n" Graphics, Walt Disney Graphics* or *Admin Xtra* for £37.99 – that's a saving of £13 in all.

Offer 2 consists of all three FSE packages for the price of two at £26.00 ex VAT – again, a saving of £13.

The offers are valid until 30th September, and orders must be submitted on LEA order forms accompanied by payment. P&P is free.

● Contact: Mirrorsoft Ltd. Headway House, 66-73 Shoe Lane, London EC4P 4AB ☎ 01 377 4645.

European Commission Slams Computer Printer Manufacturers

Citizen and Epson are just two Japanese companies reeling from the blow the European Commission dealt them, and other companies, last month by slapping a provisional 33.4% levy on their products.

Robin Marriott – European Marketing Manager for Citizen europe said "we are very disappointed with the EC's decision to impose this duty on out products and quite honestly I cannot see these levies benefiting anybody.

"Ironically I do not see the European manufacturers who prompted this levy dramatically increasing their market share and if the EC decide to extend their protectionist policies to embrace components to prevent the so-called "screwdriver" operations in Europe, the European manufacturers will be affected too, since many of their source components are from Japan too.

"The only people making a killing out of this will be the manufacturers from Korea, Taiwan and Hong Kong, who have already been given a free ticket supplying printers under European brand names."

Epson also had something to say, Jenny Lynn-Jones, Epson's Printer Business Manager said:

"The majority of our customers buy single printers and look for the highesty performance model with the specification they desire, the question of price comes a distant fifth behind performance, reliability, service and range.

"Under the new pricing structure, our customers will still be able to obtain the same choice, but will find that the RRPs (ex VAT) will differ in some cases by as little as £4 with an average increase across the range of about 10%

"But have no misconceptions. This levy will hurt Epson. It will hurt our profitability and it will hurt our investment in the U.K."

Brother are pretty full of themselves at the moment though:

. "We no longer import our dot matrix printers, and when the provisional dumping duties on typewriters were proposed in December 1984, we realised that irrespective of the merits of the case, the EC were determined to impose sanctions.

"Every effort was made to bring plans forward to establish a manufacturing plant in the U.K. and we had our first product rolling off the production line in August 1985."

The European Commission's move is hardly suprising when one considers the UK's current trade deficit and the way the EEC is being so bloody-minded at the moment – the Financial Times said that "the whole process amounted, at best, to the use of questionable methods in pursuit of doubtful benefits, and at worst, to shooting oneself in the foot".

I don't think I need to add any more to that comment, do you?

Solidisk – The Next Generation

I was a bit surprised to see this bit of info thrust into my face last week – a user group devoted to one company's products!

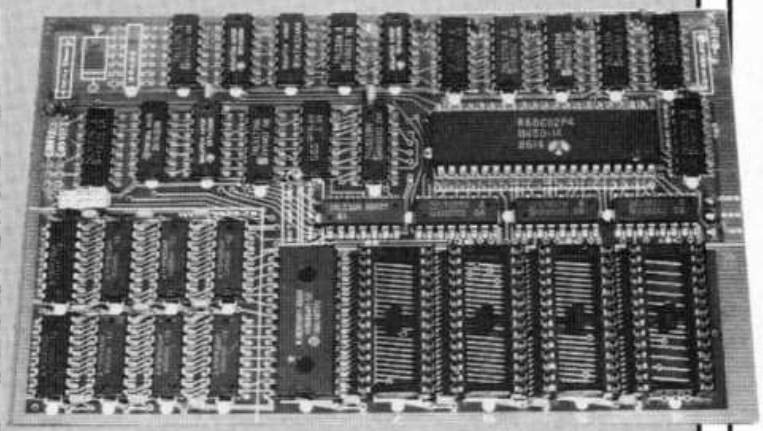
Solinet – a user group formed to support Solidisk products was founded by Andrew James because of the "hours of fruitless phone calls" and the "lack of support by Solidisk" for their customers.

There are at least 230 members of this club, but they want to go (inter)national – which is probably why I am writing about them, and why not? I have had to deal with Solidisk in the past, and it is a patient man that gets through to them at 4.00pm on a Friday afternoon!

They are producing a bi-monthly disk based magazine containing lots of goodies supporting the Solidisk sideways RAM/ROM system, Shadow RAM, Accelerator boards and commercial software reviews. The stuff they are producing isn't junk, as one might suspect. It is all perfectly good usable software – a welcome suprise these days.

Somewhat interestingly, Solinet are starting to build up a Public Domain library of software – the group is calling this branch Solilib and is currently being offered as double sided 80 track discs with nearly 200K of related programs and articles on each disc.

Last month I complained about the fact that the launch of the BBC PDSG was "too little too late", but I am pleased to say that the floodgates are being opened. We've been a little slow in coming to the fore, but I do believe the BBC Micro will have adequate PD support this time next year.



Write to these guys, send them *your* PD software, put your programs out for PD distribution (although try A&B first – we offer *money!*) – you can contact them at:

● Solilib Public Domain Software Library, 8 Hazel Way, Barwell, Leics. LE9 8GP.

Comment

Take the money and run

"I have been been reading our competitors magazines over the past couple of months with a growing sense of incredulity – not because the magazines in question have ended up the way they are, but in the way that they behave.
The point is this:

I am getting worried about the insidious presence of advertising from the likes of Apple, Research Machines and Atari in two *supposedly* Acorn specific magazines! In Acorn User, I spotted no less than three colour pages, twice advertising the Atari 520 ST system! Apple had a black and white spread proffering the Mac Plus' Hypercard as an educational tool and Research Machines had a colour page advertising the Nimbus!

In The Micro User, I spotted two pages of Atari ST advertising sitting in a prime position of the magazine – again in full colour!

Which leads me to ask the question: *What the hell is going on?*

It seems the prospect of accepting advertising from Acorn's competitors is so seductive, that *our* competitors are sacrificing their editorial standards and have done the publishing equivalent of "taking the money and run".

The thirty pieces of silver dangled in front of these magazine Iscariots are not only damaging their collective journalistic self-esteem, but also their chances of being taken seriously as Acorn specific magazines.

For example, by taking three pages of advertising in an Acorn magazine, Atari are able to place their sales pitch at the very heart of their competition, the magazine readers – after all, advertise in an Atari magazine and you are preaching to the converted, but put an advert in an Acorn magazine, and you can be assured of reaching new "virgin" territory.

So, I put it to all concerned at these magazines (you know who you are); you are not only doing your readers and your magazines a disservice by taking on these adverts, but you are also cheating Acorn out of possible sales of the Master series and the Archimedes to these companies by offering RM, Apple and Atari "unfair" media coverage, you are giving them the chance to collectively nip Archimedes sales in the bud, an act that will gain no favours from anyone other than the companies you have sold (advertising space) out to.

As it stands, by taking on this sort of advertising, you are no longer behaving like an Acorn specialist magazine because you have evidently thrown away your ability to rationalise what advertising you will and will not take.

The official word from all of us at A&B is that we will not accept advertising from any company using such blatant tactics – ie, if an ad takes away a sale of an Acorn Archimedes or a BBC Master in favour of an ST, Mac or whatever, then we will not run it in A&B's pages.

I openly challenge Acorn User and The Micro User: why have you taken advertising from Atari, Apple and RM when you clearly state on your front covers – words to the effect – that you are Acorn only magazines, why do you choose to abandon everything Acorn and their Archimedes stands for, in favour of slower, but (arguably) more established machines, when they have no link with your magazine titles whatsoever? Answer me, if you have the guts."

Clive Grace, A&B Computing

Technomatic Finally Release CAD Package

Well it was nearly two years in the making, and it had better be good...

But seriously folks: TechnoCAD looks set to wipe the floor clean with all the other CAD packages for the Beeb, just by specification alone!

Designed specifically with the Master 128 in mind – TechnoCAD is written in compiled ISO-Pascal and Assembler to make the most out of your plotter or FX80/LQ850 printer.

With a specification sheet that has nearly doubled in size since I last saw the "unfinished version" back at the Technology in Education show back in January 1987, TechnoCAD has an amazing array of features such as, pop up menus for all operations, a trackerball/mouse input facility, full rubber banding, variable line thicknesses, a gridlock, not to mention the usual array of shapes, arcs, icons and all the things you have come to expect from a high quality CAD package are here.

For schools (and other educational establishments), a free evaluation package is available for prospective teachers and users to have a look – interested third parties (such as you and me) can obtain the evaluation package for £3.

● Contact: Technomatic Ltd, 17 Burnley Road, NW10 1ED. ☎ 01 208 1177.

Desktop Diary

3rd August – 11am to 5pm demonstrations of image analysis software on BBC and Archimedes. Boardroom, Institute of Ophthalmology, Judd Street, London, WC1H 9QS. **Contact** Brian Hayes or Fred Fitzke ☎ 01 387 9621.

14-18 September – Personal Computer Show. This year held at Earls Court. Come and visit Acorn Computers and A&B Computing and Disk User for the BBC Micro.

30th September-9th October – BBC Radio Show. Earls Court celebration of 21 years of Radios 1,2,3 and 4.

October 11-13– Computer Graphics 88. Professional show at Wembley Conference Centre.

October 10 Big Ben club show – annual Dutch get together, featuring A&B and Disk User abroad.

13-15 October – Desktop Publishing Show. All types of micro. Business Design Centre, London.

11-13 November – Electron and BBC Micro Show. New Horticultural Halls time again. The fabulous Sue will be on hand at the A&B stand. So don't miss it!

17 November 1988 – Into the Future with ESG. Organised by RESOURCE, aims to explore how the Government's Education Support Grant is taking effect. Speakers from NCET, DES, TVEI and LEAs. Also discussed will be the impact of 16 and 32 bit computing. **Contact** Anne Swainston or Kevin Smith, RESOURCE, Exeter Road, off Coventry Grove, Doncaster DN2 4PY. ☎ 0302 63800/63784.

Archimedes COMPUTING

Clares Realise Archimedes Graphics Potential

Ray Tracing and the Archimedes processing power come together to form an amazing demo of sound and graphics.

Clares Micro Supplies sent us two sets of discs – which are both marked "Sound and Graphic Demo". The two disc set will probably become one of the most sought after packages for the Archimedes until the fully blown and finished products are released.

The demo discs quite frankly put the Amiga to shame with its digitized speech, good music (that must be a first for the Arc!) and some stunning graphics showing off what Clares have been up to over the past few months.

First of all, the demo starts off with some pretty impressive ray traced images of desks and a plate of fried eggs under a lamp (!), there is real-time animation of a Newton's cradle (looking as if it was supposed to copy the demo of the Amiga's *Sculpt 3D* package) and there is plenty of detail as it uses the Arc's 640 and 256 resolution.

The second animation sequence looks as if it had come straight from *The Works* (the film still being created by NASA's Jim Blyn using Cray systems!) The green crystal in the middle of the gallery is spinning so rapidly, that the Amiga's nearest demonstration was just left standing!

Wire frame graphics are so blasé these days, but with the additional speed and processing power of the Arc, a new twist is added as the Arc takes us through a city drawn and animated in real-time. The power of the Arc's screen handling and calculating facilities are put to good use here, as it is by far the fastest wire frame iamge I have ever seen on *any* system, be it Amiga, or graphics workstation – St owners don't even get a look in.

The two shots (above and below) are not animated, but the sheer detail of these examples puts the Amiga to shame.

The final *piéce de resistance* is *The Mask*, a real-time animated and revolving mask without shadowing effects, and smooth animation. It is just the sort of thing to put Amica freaks in their place, so be warned, if you don't yet have an Arc, this package will make you go out and buy one.

● Contact Clares Micro Supplies at: 98 Middlewich Road, Rudheath, Northwich, Cheshire, CW9 7DA. ☎ (0606) 48511.

Just enough space to show you the stunning game Enthar Seven – an Adventure but with some amazing graphics.

Soon to be famous and certainly sought after – Clares' "The Mask" on an Archie near you soon.

Introducing two of the latest games for the Archie from Minerva!

Float on!

The A&B Brothers

One of the first games for the Arc (games as opposed to interactive graphic demos) ARRIVED in the shape of Hoverbod – a *Jet-set Willy* type game starring a yellow sphereoid who has found himself on the planet Zingle (like you do!).

To escape the planet, he must journey through eight screens before entering the castle which contains all the feathers required for Hoverbod to take off and head for his own home world. Sounds easy?

Think again.

The first eight screens take place in various locations, in caverns, down pipelines, in woodlands etc. To sustain old "Hov" through the game, he must consume oxygen tanks, and must pick up "hover packs" which will vary the degree of "hoverbility".

Care must be taken, otherwise you may have full hover capability and swap it for zero hover capability and be stuck at the bottom of a screen somewhere.

At the end of each level you are given a password which gaining access to the last level you reached. This does help keep interest going as you can gradually make progress through the game however good or bad you are. Of course it's not all plain sailing, there are all manner of *Ibby Squibblies* (their term not mine) that scroll left and right, up and down, generally ruining your day. These can be shot once you've picked up a missile icon.

Other icons of use include one which allows certain pink building blocks to fall through from underneath you (which does actually come in handy - honest!). Mind you, not everything you pick up helps you, the portcullis icon being a case in point.

Once through after eight levels you collect the final password enabling you to go on to the *Quest for Wings*. This level seems to go on forever although there *is* an end to the whole caper I am glad to say!

To sum up: nice graphics, acceptable sound and pleasing gameplay make this the best (admittedly the only) game of its type so far available on the Arc.

Over to you Clive

Missile Control

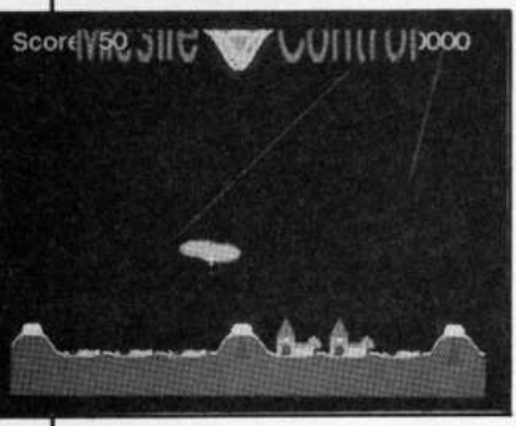
Thanks Darrin.

Missile Control is the second of the current game releases from Minerva. Based on the classic scenario of missiles slowly arcing their way down to earth, you, the controller of three strategically based missile bases, have to intercept them before they come into contact with your cities.

If you don't know this game by now, you probably haven't seen the original Atari coin-op still floating around some of the seedier grills and cafes on the more backward corners of the M1 motorway. Based on the original 8bit computer systems (still in use), Atari's coin-op had the singularly unusual feature of a trackerball fitted instead of the more usual joystick.

Released some four years ago on the BBC Model B, *Missile Base* (as Acorn's version was called), was written entirely in machine code (barring the odd bit of BASIC here and there), it used a really dumb keyboard layout for playing, and it was, at the time, one of the best versions for the home computer by far.

It is now 1988, and with the Archimedes' speed and power, Minerva have managed to



write the complete game (including some lovely detailed cities looking more like rural Oxfordshire villages) completely in BASIC V and the odd SWI call here and there!

If you thought that writing the game in an interpreted language would result in a sluggish game, then you would be wrong. Missile Base's plays very well, its reaction speed is almost instantaneous and the sound effects, whilst limited, are still very faithful to the original. The only thing I didn't like about the game was the eye boggling "The End" sequence that comes along when you have no more cities to protect, but that's personal I suppose.

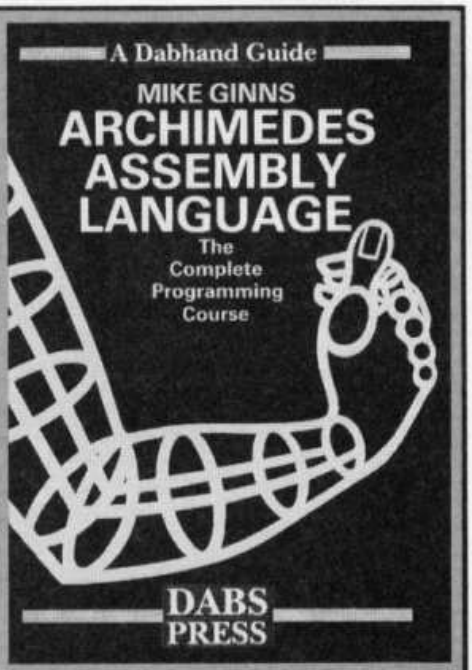
I tried using a Marconi Trackerball, using the Pineapple interface (see last month's Acorn Forum), but I couldn't get on with it, the ball's controls are all higgledy-piggledy and only useful if you can think in reverse – and I wouldn't recommend this option

Missile Command is also a bloody hard game to master. If you are used to the speed of the original arcade game at around level 5, then you will get on just fine with level 1 of this game!

Playing the game at higher levels? Well, if you can remember the way the computer in the film *Wargames* behaved when it was trying to win at Tic Tac Toe, then you will see what I mean about this game being impossibly fast at high levels.

This is not only a fine example of a game, but it is also a very good example of what can be done with Basic on the Archie, and the way the villages go poof in a mushroom cloud of incandescent radioactive proportions is really great.

Need I say more?



Details from Dabs Press, 76 Gardner Road, Prestwich, Manchester, M25 7HU. ☎ 061 773 2413.

Ever wanted to ARM program?

Archimedes Assembly Language is the straightforward title of a new book on ARM assembler. Mike Ginns has come up with a massive 368 pages and a multitude of documented examples aimed at the beginner.

The book explains how to use the Debugger – spotted that one on your HELP COMMANDS screen? – SWIs, WIMPs and fonts. Various useful techniques, such as memory allocation and access, data structures etc are discussed in relation to the ARM instruction set.

For those interested in the *Arthur* operating system, there are details on access via machine code to graphics, sound and mouse, among other features. There are BASIC to code conversion examples too.

There are sixty six example programs in all in the book and these, plus disassembler and disc sector editor are available on a support disc. The book is priced £14.95, the disc £9.95 but you can do the double for £21.95.

Anyone interested in ARM assembler should of course turn straight to Paul Fellows' series *Programming the ARM* in this issue.

Dear Arc Computing

Thanks to all of you who have taken the trouble to write to us this month. It's interesting how new trends are emerging such as Acorn's commitment to specialist users like musicians and video makers. This is matched by new games, educational and productivity software, all of which you comment upon. We are also looking forward to your comments on Computer Concept's announcement of a multi-tasking operating system in IMPULSE and Acorn's commitment to UNIX.

The main uses of the Archimedes are going to be graphics, music, desktop publishing and wordprocessing if your letters are anything to go by.

Thanks to **Stuart Boutell** who has been experimenting with his 310 (he's kept the Model B too). Stuart reveals how to get user-defined flashing colours:

VDU19,n,17,r1,g1,b1

and

VDU19,n,18,r2,g2,b2

where n = colour number r1 and r2 = red levels g1 and g2 = green levels b1 and b2 = blue levels

These commands define the RGB of each of the alternate flashing colours. As on the BBC B, *FX9 and *FX10 alter the flash rate.

Stuart feels that the Archimedes is a winner and that the software houses should take the bold step of writing software appropriate for the power of the Arc. But why don't Acorn include the Programmers Reference Manuals? Certainly not everyone would appreciate the manuals and Acorn committed themselves to delivering the Arc at a sub £1,000 price and every little counts!

Adam Sanitt liked Rick Hughes' Life program in the June issue. "The overwhelming speed of the Arc makes many programmers lazy but this program used a clever algorithm which produced quite stunning results" he says.

However one annoying feature was the programs inability to go beyond the 10000th generation (or less likely a population size beyond 10000).

Adam says it is possible to increase the buffer size but this ruins the screen display, a more elegant solution is to add the following lines:

```
6161.buffover
6162mov r1,r15
6163bic r1,r1,#1<<128
6164teqp r15,r1
6165mov r1,#0
6166str r1,Gen
6167swi "OS_Write$"
6168EQUB 31:EQUB 3:EQUB 8:EQUB
32:EQUB
32:EQUB 32:EQUB 32:EQUB 0
6169ALIGN
6170b Reentry
6320swi "XOS_BinaryToDecimal"
6321bvs buffover
```

This changes the software interrupt from *error generating* to *error returning* -instead of stopping the program when an error is encountered it merely sets an internal flag. When the flag is set the program jumps to the routine "buffover" which clears the flag, resets the generation counter, updates the screen display and returns to the main routine. Thus when the generation counter reaches 9999 it then returns to 0000.

Congratulations!

To our Reader Survey competition winner, I.B. Paget of Worcester College for the Blind. Thanks too to yourself and to Microvitec who sponsored us with the Cub monitor prize. Much appreciated.

A brief word of apology if your free Disk User disc took a while to arrive. We hope you'll understand that we gave priority to analysing the survey before mailing out to all concerned.

Get covered

BBD Computer Dust Covers have produced an Archimedes cover for the reasonable sum of £9.00. Details from BBD at The Standish Centre, Cross Street, Standish, Wigan WN6 0HQ.

Acorn at the British Music Fair

As we went to press, Acorn Computers were about to become the first computer manufacturer to exhibit at a British Music Fair, when they linked up with Electro-music Research at this years show held in the Wembley Exhibition Hall from 19th to the 24th of July.

The A&B Brothers were there and a full report will be forthcoming.

But for the time being, Acorn demonstrated the power of the Archimedes computer as an instrument in its own right, as a Midi based tool – with sequencing and composition packages and a real-time sampling option.

I approach the whole subject with trepidation – the BMF is a cut throat show, there are a lot of companies premiering new software and hardware for the ST this year, and the companies involved have heavy ties with Roland, Yamaha and Sequential, the software packages I speak of have been in continual development for well over two years and, to be quite honest, the histrionic skills of Mike Beecher at EMR will probably fall on deaf ears whilst the pros just take in the specifics of the Acorn system. If it doesn't come up to scratch, they will take one sniff and walk off to find the ST hardware and software, and no amount of sales razmatazz will bring back the professional punters.

I hope you know what you are doing Acorn – the Arc's sound system had better be supported by some good software, and the Midi system had better be without flaw, or you will get your fingers burned.

Flying Start

Mitre Software's Flying Start II is now available running *native* on the Arc. Those with a Master 512 have been able to use Mitre's database/mailing system for some time under GEM. The Arc PC emulator version has also been available since the Which? Show but now Mitre have ported to the ARM.

Mitre say that typical users are secretaries and manages in office administration, tutors and students at all levels of education and professional practitioners from accountants to zoologists

Details on 01 283 4646

Logotron Logo

Logotron's Archimedes Logo is now available and looks very promising. Complete compatibility with earlier 8 bit Logos means that all previous work can be used in the new environment. This includes support for the new graphics modes and much more sophisticated programming/debugging features. Details on ☎ 0223 323656.

External Buffer Podule for all Archimedes

SGB Computer Services have produced a buffer podule and an expansion box for the Archimedes. Designed to fit onto one of the four slots on the backplane (if fitted), it extends the 16 bit podule bus outside the machine, thus enabling easy access to all simple and external podules into the connector on a 64 way ribbon cable.

This enables the programmer or user to develop new podules on the workbench without the additional hassles of having to undo the case every time you needed to fit a podule, it also enables you to connect to an external podule box thus increasing the available podule space, and, as additional safety measure, the podule is protected against accidental damage to the Archimedes by mistakes in your prototype board.

The buffer podule is initially available without the podule box – although the box will be with us in the next couple of weeks.

For the technical buffs (pun intended), the podule is a PTH PCB with full resist and legend, holding drive chips and logic – this buffers the podule bus to externally connected podules. Simple podules (by far the most common type) and external podules are fully supported by the buffer. As far as the Arc is concerned its operation is transparent – so the podule manager ROM only sees the podule you have connected to it.

● The Buffer podule costs £49.50p inclusive and is available from SGB Computer Services, 140 Disrali Road, London, SW15 2DX. ☎ 01 874 5675.

STOP PRESS....

● DABs are also breaking into the Computer Games market with a game called **Alerion** – a shoot em up (thank goodness ... games were beginning to get a little too sadate for my liking! – Ed). Boasting super fast scrolling action, and full colour graphics -- DABs confidently tell me that they don't think anyone will be able to finish it! Now *theres* a challenge if ever I heard one!

Alerion will cost £14.95.

● Contact DABs press at 76 Gardner Road, Prestwich, Manchester, M25 7HU. ☎ (061) 773 2143.

Architexture

If you are embarking on programming with the Archimedes you should check out Hopesoft's ArchiText text editor. There are two versions, one for BBC BASIC and one for other source files. It supports Mode 19 (if you have a Multiscan monitor) for 64 character lines. Line terminator characters are recorded and tabs can be expanded into spaces if your compiler requires. You can call up the BASIC editor from BASIC with the keyword TWIN and exit straight back into BASIC with your program intact.

ArchiText features wordprocessor style search and replace, with wildcards, block copy, move and delete. The program comes with a 16 page manual with full instructions and a brief tutorial.

Details from HopeSoft, Hope Cottage, Winterbourne, Newbury, Berks, RG16 8BB.

First Fonts

Ian Copestake Software have released information about their *First Fonts* for Acornsoft's 1st Word Plus wordprocessor. As well as providing special characters on screen and paper, First Fonts can give access to printer features not normally available from 1st Word Plus, such as justified proportional spacing and typeface selection. First Fonts cost £19.00 + VAT or £14.00 if ordered with 1st Word Plus.

Details from 10 Frost Drive, Wirral, Merseyside, England L61 4XL. ☎ 051 648 6287.

FAX Package Spills The Beans About CC's Arc Modem!

Computer Concept's latest package for the Archimedes looks set to push the machine further into the office than ever before.

An interesting new software development brings the world of Facimile document transfer to the Archimedes. Based around CC's own 9600 bps Modem Podule, this can send and receive fax transmissions from anywhere in the world – that means type 2 and 3 FAX machines.

When used to communicate with another Archimedes, it can be used as a fast modem, but at the moment CC are planning to sell the package simply as a fax package.

● Level 1 will consist of the software and Modem for an estimated £499

● Level 2 will include level 1 but also a 200 DPI document scanner at £799.

● Level 3 – the top of the range, will offer a 300 DPI flat bed scanner with grey scale in addition to Level 1 and will retail at around £1100.

Needless to say, the only thing holding back Computer Concepts is the thorny subject of BABT approval.

Adult Literacy on the Arc

A powerful tutoring system is being developed for the Archimedes by System Applied Technology. The MSC funded software is being designed with the help of adult literacy students and tutors.

It is centred on a wordprocessor tailor made for the needs of literacy students, linked to an extensive database of learning material. Under the Forms option, for example, a variety of areas will be available including tax returns, pass-port and employment applications. Other options contain sample letters, curriculum vitaes and text references.

The most promising aspect of the software is the intended use of artificial intelligence techniques to tell the student there is someting wrong with his or her writing. Comprehension, style, punctuation, spelling, layout, proof reading and vocabulary will also be covered.

Jane Horton and Jed Fraser of System Applied Technology would like to hear from anyone else with experience to share. Contact them on ☎ 0742 768682.

Clares Release Buffer Module

Clares Micro Supplies, in addition to releasing their graphics and sound demonstration discs, have just released an Archimedes Buffer Module.

Configured either as a serial or printer (parallel) buffer, each one can be configured from just a few bytes to 4 megabytes, just in case future machines will address this sort of memory – nothing like allowing for future expansion!

Clares state that their Module is totally legal (unlike some others around at the moment), it is transparent in use, and it is very safe – the only way to lose data in the buffer is by doing a hard break – so Clares tell me.

For long documents, databases, labels or graphics, then this package looks to be pretty useful, and for just under £20, it has got to be worth the asking price hasn't it boys and girls?

Fifty Fifty

If A&B readers continue to buy the Acorn Archimedes as they say they will, 50% of A&B Computing's readership will own one by the end of 1988. That's one of the more interesting facts to come out of our April Reader Survey and shows a high degree of commitment to the new technology that Acorn have developed to take over from the BBC Micro. A&B Computing is commited to supporting all Acorn computer users so drop us a line and tell us what you would like to see in future issues.

And now for some light reading ...

DABs press have really been at it this month – releasing no less than nine books over the next coming months!

C – A Dabhand Guide is not only for the Archimedes, but also for the excellent C compilers for the BBC B+ and Master and the additional demonstration discs will be for Beebug C and Zorland C for Master 512 owners – the book costs £14.95, whereas the discs cost £7.95 and £9.95 for 5¼ and 3½ inch respectively.

Master 512 – a Dabhand Guide is currently being set, and should be ready by the end of July – there's been a lot of interest in this book – and also **Mini-Office II – a Dabhand Guide** (see also the news item on MiniDriver II).

The talked about series of books for the Archie are all currently undergoin final editing and setting. Tentatively called *MiniGuides*, these books will cover specific topics such as: **Archimedes First Steps, Archimedes PC Emulator, Using Interbase, ADFS** and **BASIC V** – these titles are being produced due to demand, but because of the lousy Acorn documentation, I think there will be many users out there hungry for more information.

A Dabhand Guide

MARK BURGESS

Including sections for all popular micros

DABS PRESS

DABS PRESS **Archimedes Dabhand Guides**

Serious Books for the Serious Archimedes User

Archimedes Assembly Language

At last the first book specifically written to provide a complete guide to programming the Archimedes in machine code. Whether you are an Archimedes owner, a user, or just interested in the ARM chip this book is truely the definitive guide.

In a massive 368 pages, author Mike Ginns provides a clear, step by step account of using the assembler. Many simple, useful, documented programs provide the practice to illustrate the theory making it ideal for the beginner.

But this book goes much, much further. For instance it explains how to use the Debugger and there is a large section on implementing BASIC equivalents in machine code plus coverage of Arthur and use of SWIs, WIMPs, the Font Manager, graphics and sound.

The book is applicable to all Archimedes computers and includes a full reference section. A programs disc is also available.

Price: £14.95 for book, £9.95 for disc, £21.95 ordered together.

C: A Dabhand Guide for Archimedes, Master, BBC

In an amazing 512 pages this thoroughly readable Dabhand Guide is a must for Archimedes, Master and Beeb owners. It describes in detail from first principles how to program in the language that is fast becoming the world standard and the natural successor to BBC BASIC. Littered with example programs at just £14.95 it's incredible value! Programs disc: Archie £9.95, BBC/Master £7.95. Book and disc together: Archie £21.95, BBC/Master £19.95 (£21.95 3.5").

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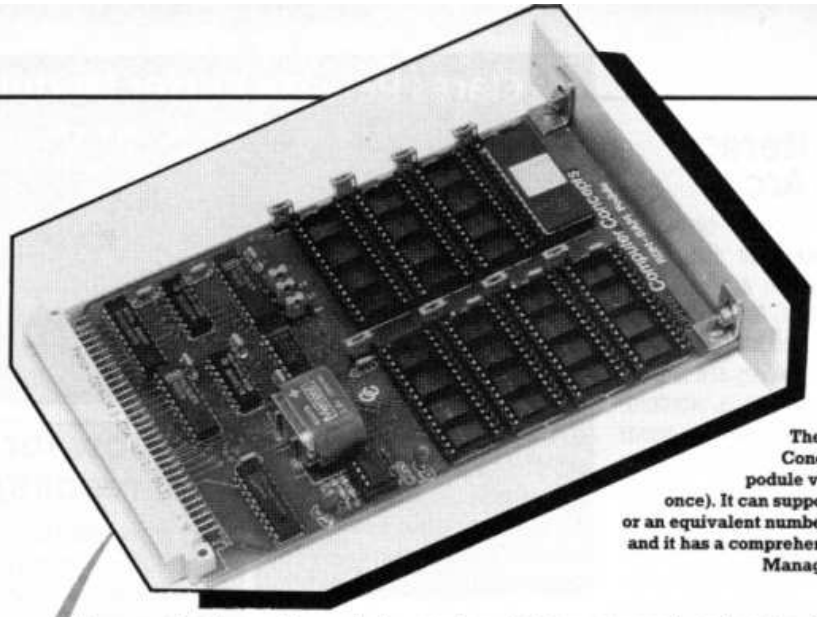


The Computer Concepts ROM podule vacated (for once). It can support 7 ROMS or an equivalent number of RAMS and it has a comprehensive ROM Manager system.

Mass Memory

Trevor Attewell

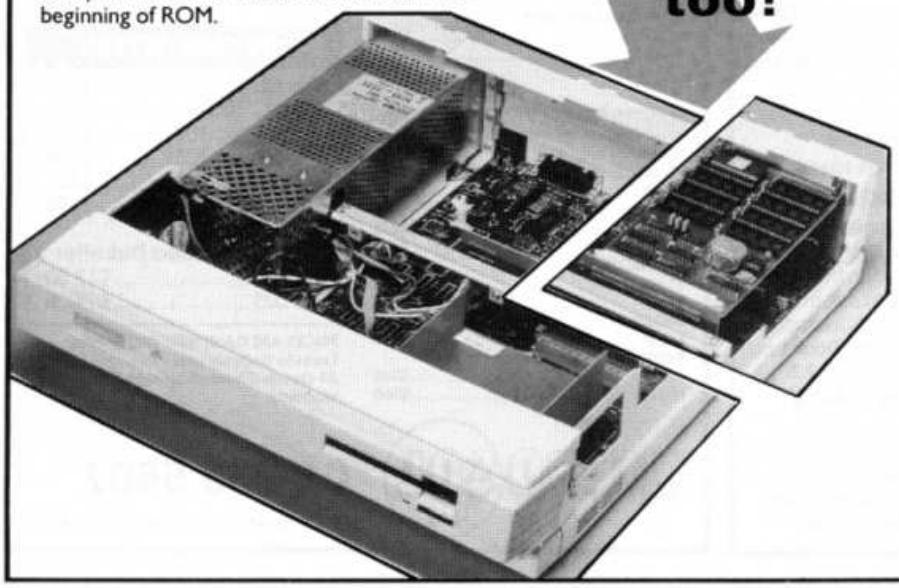
Computer Concepts' ROM/RAM podule is more than just another place to put commercial ROMs – it can be the basis of a most useful filing system too!

In this article we examine Computer Concepts' alternative to Acorn's own ROM/RAM podule, particularly the use of the ROM/RAM filing system.

Before any podule can be fitted to a 300 series machine, it is necessary to fit a backplane (the 400 series has one already). This is an added expense, but a backplane can hold two podules, so the cost is effectively spread over the total number of podules that you will eventually own (probably more than 2!).

The podule has eight 32-pin sockets, of which seven are empty, and these will take any combination of RAM and ROM, using chips of up to 128Kbytes capacity, including those with 28 pins. However, the available sockets cannot be mixed indiscriminately.

Position 1 is already occupied by the ROM Manager, which has the highest priority, and must never be removed. Any RAM chips must start from socket 2 upwards. ROMs must start from socket 8, the lowest priority, and there must be no unoccupied sockets except between the end of RAM and the beginning of ROM.



Every socket has a 2-way link near it, which decides whether that socket will be powered from the computer supply or from the backing battery, which float-charges from the supply. Only CMOS RAM should be battery powered, and never ROMs, which draw relatively heavy currents and cannot lose their contents anyway.

The battery is an optional extra, but I would strongly recommend its use if RAM is fitted. It may take up to about 10 hours for the battery to charge fully when first fitted, but it should then last for at least six months with the computer off. This implies that you will not be caught out by a flat battery as long as the computer is switched on for a couple of hours each month – this must cover 99% of users!. However, regular back-ups to disc should be routine practice.

It also makes sense to visually inspect any rechargable battery at least once a year, checking that there is no corrosion or other sign of leakage (every non-rechargable battery should be replaced annually, regardless of use or condition). Most modern batteries are well sealed, but one has only to see the havoc caused by a leaky one to be convinced of the wisdom of routine inspection and early retirement.

When the chips are down

128K RAM chips are almost impossible to buy at the time of writing, and cost about £70 apiece if you can find one. While you are waiting, a 32K RAM can be had for around £15 inclusive, and one or two of these will go a long way towards making life easier.

After fitting ROM or RAM the Manager is unaware that it is present until configured. The easy way to do this is by *AUTO-CONFIGURE n, where n is the podule slot number, which can be in the range 0-3 for the 400 series, but must be 0 or 2 on the 300 series. This call will initialise every used socket automatically, but it will delete any RAM contents, and a warning is given before execution.

The alternative is to configure each socket individually, using *ROMPOD, followed by appropriate parameters. *ROMPOD followed only by the podule number will list what is on board according to the configuration data, so that omissions or errors can be spotted and rectified. However *ROMPOD can be very useful as a software device to unplug any ROM, and it survives even a power-down. The same command will reinsert the ROM if its type number is appended to the parameter list.

The contents of a ROM cannot be lost if it

is unplugged or written to, but unplugging RAM can be risky – if any files in the unplugged RAM cross the boundary between one RAM chip and another the file structure will be wrecked, resulting in the total loss of all RAM files, whether they were in the unplugged chip or not.

For compatibility with Acorn's ROM filing system, the *CONFIGURE ROMBOARD command is also implemented. However, there is little point in using it unless both boards are fitted, which seems unlikely.

Some other useful features are available when using ROM files. These automatically have the file attributes LR, meaning that they are locked, and may only be read or loaded. An attempt to set the write attribute will simply be ignored, for obvious reasons. Despite the fact that ROM files cannot be unlocked, they can still be deleted by *DELETE <file>, the locked status being ignored.

Of course the ROM is not physically deleted, and the actual result is to remove the deleted file(s) from the RFS catalogue in the Archimedes RAM. This allows files to be removed temporarily. The files will reappear when the RFS catalogue is reconstructed after a hard break or shut down, or when the ROM/RAM board is reconfigured with *ROMPOD.

Clean up

ROMs can also be deleted with *WIPE, in which case the F attribute must be added, but care is needed if wildcards are used, because *WIPE * F will delete all ROM and RAM files, and the latter will be irrecoverable. *WIPE F ~C is worse, since it deletes everything without even asking if you mind. On the other hand it can be used deliberately as a quick way of clearing out all RAM files.

ROM files can also be temporarily renamed, and this offers a way around the problem of filename duplication in different ROMs. The change only holds until the next catalogue re-build, but the name changes can always be incorporated into a BOOT file. Where names are duplicated only the higher priority one will be accessible, but the lower one can be reached after temporarily renaming the higher.

Although the *COPY command can be used in principle to copy ROMs to RAM (or disc), in practice the anti-piracy measures adopted by many manufacturers (and some programming techniques) will mean that the copy either will not be made, or will not work in the new medium. Since it is difficult to think of a legitimate reason for copying ROMs, nobody should complain.

If you have modules or programs that will be used frequently, it may be worth blowing them into ROM(s). This ensures that they will not be accidentally deleted, or lost if the back-up battery is discharged too far. Computer Concepts have provided a utility in the Manager, called by *MakeROM, that accepts as many files as the space that you allocate will hold, adds a short header and stores them as an image file on disc.

An EPROM blower is needed to finish the job, but Computer Concepts offer a service if you have no access to one. Before committing it to EPROM, the image can be tested by loading it into a RAM chip, using the *ROMLOAD <podule no> <socket no> <image name> [<offset>] command. In this case the optional offset is omitted. A hard break is required before the image and its files are recognised, after which the files will appear in the normal catalogue, and they can be handled by all the usual filing system commands. *ROMLOAD must be used with discretion since, like *ROMPOD, it can destroy the entire file list (see above).

It is worth noting that ROMs, as used on Archimedes, simply contain files which are transferred to main memory to be used. Thus the only significant difference between ROM and RAM files on the Archimedes is that the former cannot be accidentally erased or overwritten. This is somewhat different from the way ROM/RAM is used on the BBC series.

Loads of speed

The use of a "RAM disc" to store frequently required modules, programs and data files is a very convenient option, giving rapid access without the need to change and mount floppies, but avoiding the inflexibility of ROMs. File transfer to or from main memory takes place at around 300Kbytes/s, compared with about 15Kbytes/s for the ADFS, a twenty times increase in speed. The transfer is silent, and the absence of mechanical components reduces the probability of break down or data corruption to a negligible level.

The RFS uses the same commands as the ADFS where appropriate, and handles all Fileswitch and OS "star" commands. Nine ADFS commands that do not apply to the RFS (VERIFY, DRIVE and so on) are simply ignored, and do not generate an error. The same applies to superfluous arguments, for example a disc specification following a command. The RFS can be directly addressed by prefix from within other filing systems (eg *-RFS-<filename>, or the alternative form *RFS:<filename>), and vice versa.

However, the RFS has no true directories, which the Acorn ROM file structure does not support. Instead, they are simulated in a manner transparent to the user. One result is that a "Directory full" error is generated when the total number of objects (ie files + directories) would otherwise become greater than 79. CC say that this number may change in future versions.

The amount of RAM occupied by files will usually include spaces into which the RFS was unable to fit whole new files, exactly as on disc filing systems. Both the COMPACT command, and a warning of the need to use it, are therefore supported.

Another useful option on the board is a link which can be set to write-protect the RAM. This will prevent accidental overwriting, but not deletion by AUTOCONFIGURE or by battery failure, so it should not be used as an alternative to file backups.

One very important use of the podule is to make the computer start up with the RFS as default filing system, and to execute a boot file from it. The boot file can configure the machine, install modules, chain programs, select another filing system and enter a language. This last action will automatically exit the boot file.

It is also possible to set the system variable Run$Path to search for a *RUN file in the RFS only, or in the RFS first, followed by the ADFS if it was not in the RFS. This allows an RFS file to be loaded quickly in preference to the same file on the ADFS, when both are available.

Another useful possibility that can be exploited by a boot (or any other) file arises from the fact that 16 bytes of Archimedes CMOS RAM (locations 30 to 45) are reserved for the user. This gives 128 bits, each of which could be set to indicate individual start-up preferences not available among the normal configuration options.

A simple example might be to supply data or defaults to an applications program according to the particular use, which might change from time to time. The boot file could test the bits allocated in CMOS RAM, and supply the appropriate data, passed via the resident integer variables (which can be made to code for real or string variables if necessary), before running the application.

The only competitor for this podule is the similar "official" one from Acorn. Although I have not had the opportunity to examine this, it appears from published information that it only accepts two 32K RAM chips, does not recognise the CC module (though the latter can access Acorn's), and is very much slower at data transfer. The Acorn version is sold without battery back-up, which must be fitted by a dealer unless you are prepared to void the warranty by doing it yourself. The CC board, on the other hand, is supplied with or without battery back-up. Finally, the CC version is about £10 cheaper.

Thumbs Up?

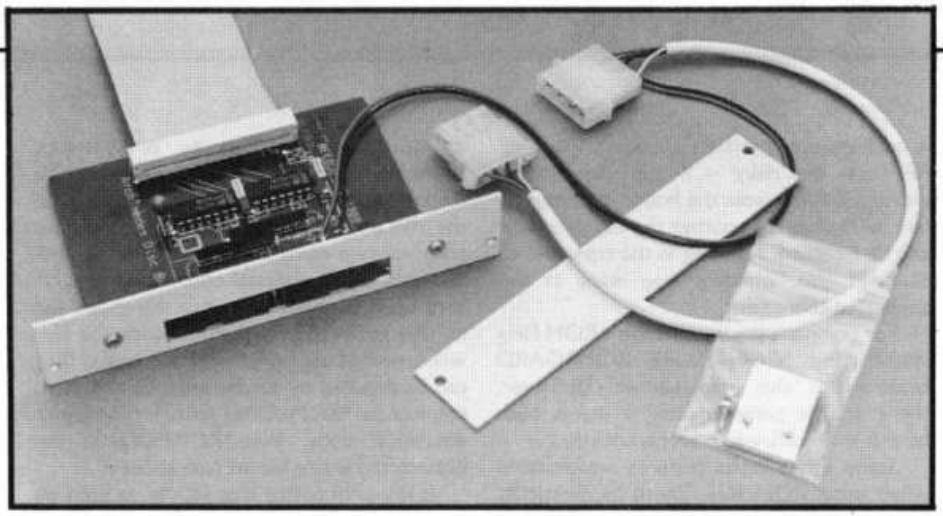
Having used this podule extensively for several weeks, I can recommend it unreservedly as a valuable extension to the Archimedes system. It is manufactured to high standards, requires only a screwdriver and a few minutes of time to fit, and comes with a very readable and comprehensive 49-page laser-printed manual.

The uses for a battery-backed RFS are alone worth the cost, not to mention the ability to use future commercial ROMs, for example from Computer Concepts themselves, for which this podule (or something very like it) will be essential.

Factfile

ROM/RAM Podule from Computer Concepts, Gaddesden Place, Hemel Hempstead, Herts, HP2 6EX, tel: 0442 63933. Price: £56.35 (standard version) or £67.85 with battery backup, both prices inclusive.

● In our April issue Gordon Taylor considered its installation and use of the Podule, with particular reference to CC's own products. Back issues are available on 0442 776661.



The package consists of a backplane, a cable and a neat little plastic bag with some bits in it.

Trevor Attewell

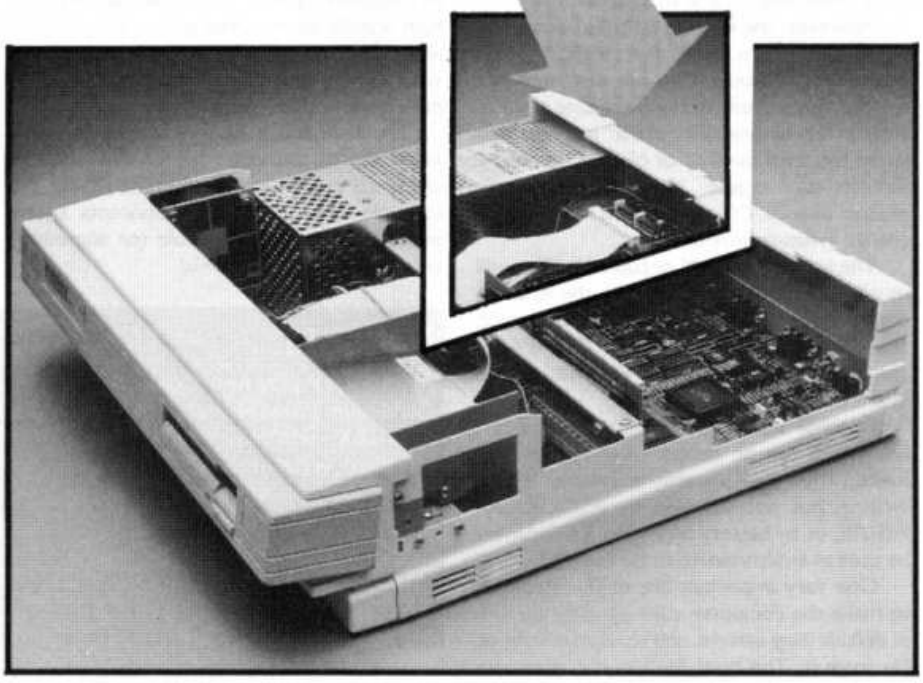
Mass Media

Attaching BBC disc drives to your Archimedes can save money and avoid frustration. Beebug's utility makes it easy

The majority of Archimedes owners have only one disc drive, and know what a pain it is to copy a number of files and directories recursively from one disc to another. The number of times that prompts must be answered and discs swopped becomes mind numbing, and one slip can send you straight back to square one.

Adding a second internal drive is the neatest solution, but if you still have your old Beeb, or at least your 5.25in disc drive(s), you can use them on the Archimedes, provided that they are double-sided, with 80 track capability, and that they have their own power supply. You may do damage if you plug them directly into the Arc's circuit board disc connector, but several suppliers now offer interfaces which are fully buffered and safe to use. The Beebug version is particularly well designed and very easy to handle. There is nothing to solder.

The necessary circuit board is small, but Beebug have opted to assemble it on a half-width blanking plate which can sit alongside an existing podule. The interface does not need a backplane connector, and a spare half blanking plate is supplied for use when no podule is fitted. This mounting method gives good mechanical security, and there is no risk of accidental contact with the main circuit board.



Furthermore, since the external disc connector is on the rear plate, there is no dangling lead to be accidentally tugged. The cable from the main circuit board to the interface is amply long, and carries three sockets – the end one plugs into the main board, while the others connect to the internal disc drive(s). The small amount of power required by the interface is taken from the hard disc supply, which is duplicated on the cable in case a hard drive is, or will be, fitted. When not in use this is left coiled up inside the computer, and I suggest that the loose connector should be protected by an insulating cover of some kind (gaffer tape will do).

With a single internal drive, I found that the neatest way to stow the surplus cable was to fanfold it on top of the internal drive.

Connecting external drives is very simple – it is only necessary to plug the drive cable into the Beebug interface – but some reconfiguring of the drives may be needed, depending on the arrangement you want. Every disc drive is configured by internal links or switches so that it can be addressed uniquely by the computer.

In the case of BBC machines fitted with a DFS, a single disc drive (double-sided) would normally be configured so that one disc surface is numbered 0 and the other 2. A second drive would be numbered 1 and 3 correspondingly. However, the ADFS used by the Archimedes treats both surfaces of a disc as part of the same surface, so the same two drives will become ADFS drives 0 and 1. In fact it is possible to fit a maximum of four external drives, though most of us don't own (or need) that many, and the Arc only supports a total of four floppy drives, including internal ones.

Add another nought

A single Archimedes disc drive is factory

configured as disc 0. More than one drive 0 is not permissible, so an external drive 0 would normally need to be changed, for example, to become drive 2. This can be a tedious job, especially when the drive proper and its power supply are stuffed into a rectangular plastic case from the front, with the cable coming out from the middle through the rear end. When two of these wretched things are cabled together, getting at the links in either of them is a Chinese puzzle. Worse, you would need to change the configuration every time you move the drives from one computer to the other.

With this in mind, Beebug have included an internal link in the interface which inhibits any attempted access to an external drive 0. Without reconfiguring anything, the internal drive remains drive 0, an external drive 0 is ignored, and a second external drive will be drive 1. Both external drive lights may come on when any drive is accessed – this can be cured by changing drive links, but may be hardly worth the bother. If all three drives are needed, then the external drive 0 can be made drive 2.

It is possible to have an external drive 0 if you wish, in which case the internal drive must be removed and reconfigured, and the Beebug inhibiting link must be changed. This is a simple soldering job, but Beebug will do it for you (free) if you aren't happy to do it yourself.

No power supply is provided for external drives. Overheating and power regulation failure caused by supplying too many peripherals from the computer power unit were all too common on BBC machines, and we should have learnt the lesson. The best practice is to provide separate power supplies for all peripherals and bolt-on goodies, except those specifically provided for in the Arc, eg internal drives and podules. If your drives are not separately powered, the maker may be able to offer an add-on supply.

Configuring floppies

As reported by other users I found that the Arc will often refuse to boot correctly if external drives are powered up before, or at the same time as, the computer. Nearly all mains operated drives have their own power switches, so it is easy enough to turn them on after the Arc. Hard breaks do not appear to cause any problem.

Once connected, it is necessary to *CONFIGURE FLOPPIES 2 (or more, as appropriate). The 5.25in discs can then be formatted and used by selecting the required drive number as usual.

Discs already ADFS formatted, eg from a Master, should be useable as they stand, including any Archimedes compatible files. The format will be 640K ("L" on the Arc), which cannot be backed up directly on to "D" format (800K) discs or vice versa, but copying the files from one to the other is straightforward and fairly quick (with two drives!).

It is also worth noting that the "disc inserted" line is not serviced by most add-on drives, and this can result in an "Empty drive" error even when a disc has been inserted. The solution is to *MOUNT first, especially in programs, where an untrapped error may cause problems.

If you use the desktop you will see only two disc icons, even if you have configured more than two drives. The only cure is to modify the desktop program to suit.

Conclusion

This very useful hardware utility is well designed, safe and easy to fit and to use. Most users will not need to struggle with the links in their drives, since a dual external drive can be transferred between the Archimedes and any of the older BBC machines merely by re-connecting one cable. The instruction sheet (and a separate note concerning drive 0) doesn't take long to read, but the whole business is so simple that nothing more is needed.

Factfile

5.25in Disc Drive Interface from Beebug Ltd., Dolphin Place, Holywell Hill, St. Albans, Herts., AL1 1EX. Price: £29.05 (Members £27.60) including VAT, PP £2.00.
For anyone wishing to convert DFS 5¼" floppies, the A&B DFS to ADFS transfer program is available as part of Archimedes disc 2. See the advert in this issue.

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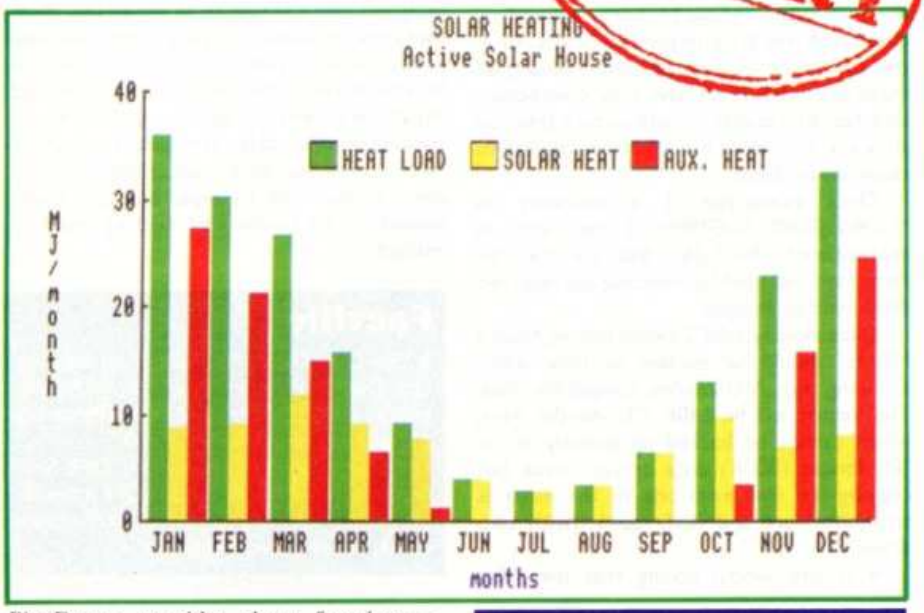
Archimedes

REPORT

Gordon Taylor looks at the latest in productivity software for the Archimedes



Effective colour dump using the graph option

PipeDream provides three functions – word processing, a spreadsheet, and a database – in one integrated package. This article reviews the Arc and also has a look at the almost identical PC versions.

These are based on the ubiquitous PipeDream for the Z88 portable computer, and View Professional for the Model B/Master, which in turn evolved from View and ViewSheet – all products of Colton Software. However, whereas View Professional can be driven only by commands entered from the keyboard, PD for the Z88 has different commands, and a complete menu system. PD for the Arc has the same commands and menus, but is extended to cover the additional capabilities, and also dialogue boxes. All versions are file-compatible – both ways.

PD is not copy-protected, but it must be "installed" before use. This stamps the working copy with a unique number, which is traceable. It can thus be installed any number of times for backup purposes onto floppy or hard discs.

The Arc version of PipeDream can use any screen mode with 80 or 132 columns, and 32 or 25 lines, with a standard monitor. It will also run in Modes 18, 19, and 20, with 64 lines, on a multi-frequency monitor. PD starts up in Mode 12 by default, but may use any suitable screen mode by entering "PD /n" from the keyboard. As with other applications on the Arc (and the Model B/Master), the choice of screen mode affects the RAM required, and hence that remaining for data. Since PD requires no more 4 colours, the best choice is usually Mode 8, needing only 40K.

Two utilities can be used with advantage with PD (and many other Arc applications) and PC. PC comes with the PC Emulator, and may be used to reset all "sizes", and "kill" any unwanted Modules (which may take workspace), without changing the configuration held in CMOS RAM. This can make more RAM available for data, and even enables PD to be run in a 305, with a document of some 10,000 words (or 64K). Of course, you can also use the multi-file facility for longer documents, and linking files between spreadsheets (see below). "Squeeze" should also be available from your Acorn dealer at nominal cost. This can be applied to any ARM "binary" (ie machine code) file, and compresses it to about half the original length. I applied it to the main PD file of 240K, which reduced it to 118K. This leaves more space on the disc, and enables it to load in slightly less time. However, it should only be applied after you have "installed" PD, and only to the working copy.

A very similar version of PD is available for the IBM-PC and compatibles, and this also runs well on the 80186 co-processor. PD works best when the 80186

From the bar chart – a pie chart is also possible using another option from within Pipedream. Colour is, again an option with the correct driving software.

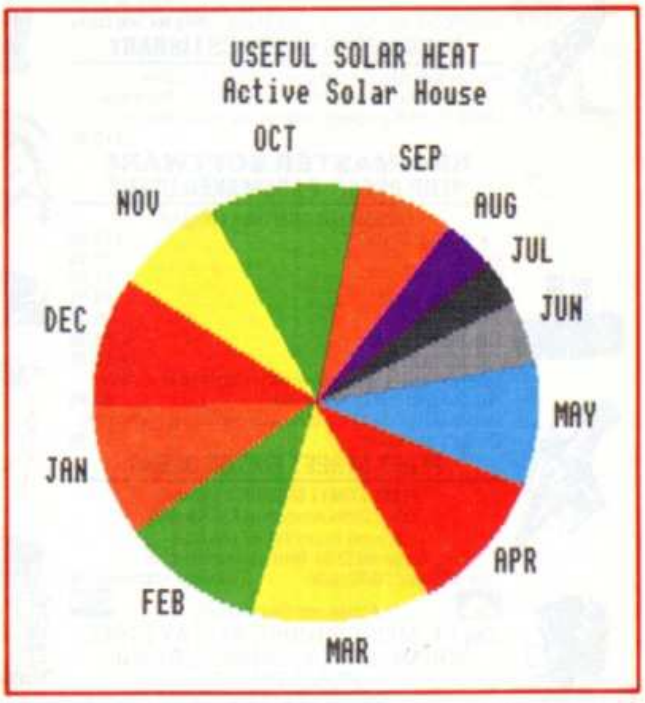


Fig. 1 PIPEDREAM MENU MAP

Files	Edit	Layout	Print	Blocks	Cursor
Load...	Delete character	Set column width...	Print	Mark block	First column
Save...	Insert space	Set right margin...	Set parameter...	Clear markers	Last column
Name...	Insert character...	Fix row	Page layout...	Copy block	Next word
New	Delete word	Fix column	Printer configuration...	Move block	Previous word
	Paste	Move margin right	Microspace pitch...	Delete block	
Next file	Delete to end of slot	Move margin left	Status...	Sort...	Save position
Previous file	Delete row			Replicate...	Restore position
Top file	Insert row	Right align	Underline		Swap position and cursor
Bottom file		Left align	Bold	Search...	Go to slot...
	Insert/Overtype	Centre align	Extended sequence	Next match	
Create linking file...	Swap case	LCR align	Italic		Define key...
Macro file...	Edit expression	Free align	Subscript	Number () Text	Define function key...
	Insert reference		Superscript	Snapshot	
Options...		Decimal places	Alternate font	Word count	
Colours...	Split line	Sign brackets	User defined	Recalculate	
	Join lines	Sign minus		Format paragraph	
* Commands	Insert row in column	Leading characters	Remove highlights...		
Help...	Delete row in column	Trailing characters	Highlight block...		
About...	Insert column	Default format			
Exit	Delete column				
	Add column				
	Insert page				

The Pipedream menu map

is connected to a Master 128, (as in the Master 512), since this has a numeric pad giving direct access to the "Home", "End", "Page Up", and "Page Down" functions. However, thanks to the comprehensive menus, PD running on the 80186 can be controlled completely from a Model B. Furthermore, PD (like most other PC programs) can take advantage of the Solidisk "PC Plus" upgrade for the 80186, which increases the RAM available by about 346K (ie from about 422K to 768K, when measured as for a PC running MS-DOS). (See A&B, 87/7, p16). The PC version of PD also runs perfectly well – but very slowly – on the Arc PC Emulator. This would not be the preferred choice, but remains an option for those who want to use it mostly on a PC or clone (or the 80186), and only occasionally on the Arc. However, the Arc version is not only far faster, but also takes full advantage of the better screen modes. It uses the Floating Point Emulator if necessary, but both the Arc and PC versions will use a hardware floating point unit, if present.

Among the most striking things about PD for the Arc and the PC are the huge maximum numbers of rows and columns.

These numbers depend upon the number of bits used for the internal "pointers". For the Model B/Master and Z88 versions, 255 columns resulted from the use of 8-bit pointers. However, for the PC version, 8192 columns relates to using 13 of a possible 16-bits, and for the Arc version, 500 million columns to 29 of a possible 32-bits. Large numbers of rows are necessary for word processor documents – which typically have single columns, but may run to many thousands of lines. They are also very useful for datafiles, which may have say 20 fields (columns), but many thousands of records (rows). Having decided the minimum requirements, these numbers were chosen to give the highest performance with the respective machines.

More than just a PipeDream

The PD menu map is shown in Fig. 1. The first (leftmost) menu "File" is "popped down" by pressing either of the Alt keys. The other menus may then be accessed by pressing the left and right arrow keys. This action, and selection within the menus themselves with the up and down arrow keys, "wrap around" for convenience. Thus the fastest way to the bottom is to go up from the top.

Even in 2 or 4-colour modes, you can still choose from a 16-colour palette. However, this defaults to that of the Model B/Master, with half of the "colours" being flashing pairs, so the real choice is from only eight.

Such colour and other preferences are not stored with the document, (as in Inter-Word), but can be saved in the initialisation file, so that PD starts up "as you like it". This file holds no data, but holds the column structure, the option settings, the colour settings, the page layout settings, and the printer driver information. PD also looks for a second, (optional) initialisation file, "PD.KEY". This may be used to redefine the keyboard, but could also be used to load a template document or sheet.

*EX.

PD can load and save part-sheets, which should be especially useful when working between the 8-bit and 16/32-bit versions – when the whole file may be too large for the target machine. A second, backup copy can be maintained (manually) for both single- and multi-file documents, by prefixing the filename with a drive number or directory name (since this does not cause it to be renamed). Certain types of data should not be saved in the column-by-column PD format. For example, the row-by-row <Tab> format must be used for macro files, mail shot "parameter" lists, and printer drivers.

PD has a multi-file mode which may be used to provide a form of "context-switching". Thus, if you are working on text and accompanying tables (as I am here), you can hold them as separate files in a single multi-file document. This works well even with a floppy disc, since that of the Arc is fast and has high capacity, and works even better with a hard disc.

Fig. 2 WORD PROCESSING PERFORMANCE

"Byte" document of 4000 words — Times in seconds

Package	Computer	Disc	Load	Save	Search	Scroll
Inter-Word	Master 128	ADFS 640 K	4.5	4.8	3.7	16.0
Word 3.0	IBM-PC	DOS 360 K	5.7	30.0	18.2	90.1
WordPerfect 4.1	IBM-PC	DOS 360 K	4.2	15.9	8.7	75.7
Wordstar 3.3	IBM-PC	DOS 360 K	4.2	26.7	12.5	48.6
Wordstar 3.3	Acorn 80186	DOS 800 K	9.1	15.5	1.7	26.7
PipeDream	Acorn 80186	DOS 720 K	8.5	12.0	5.0	68.3
Inter-Word	Arc 310 - Mode 12	ADFS 800 K	3.4	4.4	8.4	13.4
ArcWriter	Arc 310 (Mode 12)	ADFS 800 K	16.0	8.2	3.0	92.2
Graphic Writer	Arc 310 (Mode 12)	ADFS 800 K	3.0	4.5	1.0	7.0
First Word Plus	Arc 310 (Mode 12)	ADFS 800 K	5.2	6.5	3.0	50.5
PipeDream	Arc 310 - Mode 0	ADFS 800 K	4.0	5.1	2.0	13.4
	Arc 310 - Mode 8	ADFS 800 K	"	"	"	16.0
	Arc 310 - Mode 12	ADFS 800 K	"	"	"	19.0
	Arc 310 - Mode 20	ADFS 800 K	"	"	"	28.5

Results for packages on IBM-PC from Byte, Oct 1986, p 262

Performance chart in seconds using a Byte Document of 4000 words

File Handling

If you do not know the name of the data file to load, you can reply to the dialogue box with a wildcard symbol, and PD puts up a file selector (with directories usually shown in red and files in black). You can then highlight a name, and press <Return>. This also allows you to move around the directory "tree" structure. Pressing <Escape> takes you to the "star" prompt, which is convenient for mounting new discs, changing file access, and entering

Character Assassination

Like most of the word processors available to date – PD is purely character-based, and uses only the single, constant-width, system font on screen. Although there are some which are graphics-based – such as Microsoft Word for the PC and the Mac – they are slow on 16-bit processors, and really require 32-bit processors. While ArcWriter is also slow, it is really only intended as a demo, and the forthcoming multi-font word processors should be acceptably fast on the Arc.

SPREADSHEET PERFORMANCE

"Liardet" model

Package	Computer	Max Cols.	Max Rows	True Cap. - rows	Recalc. - rows/s
Inter-Sheet	Master 128	63	255	86	11.6
1-2-3 v.2	IBM-PC - 256 K	256	8192	92	6.5
1-2-3 v.2	Acorn 80186 - 512 K	"	"	307	23.4
1-2-3 v.2	Acorn 80186 - 1024 K	"	"	882	24.2
PipeDream	Acorn 80186 - 512 K	8192	500 M	162	12.1
PipeDream	Acorn 80186 - 1024 K	"	"	730	12.7
Logistix	Arc 310 - Mode 12 std	1024	2048	208	29.3
Logistix	Arc 440 - Mode 12 std	"	"	2048	34.0
PipeDream	Arc 310 - Mode 0 std	500 M	500 M	678	56.3
	max	"	"	774	"
PipeDream	Arc 310 - Mode 8 std	"	"	653	54.2
	max	"	"	746	"
PipeDream	Arc 310 - Mode 12 std	"	"	576	48.9
	max	"	"	662	"
PipeDream	Arc 310 - Mode 20 std	"	"	411	38.0
	max	"	"	555	"

The Spreadsheet performance chart using the liardet model

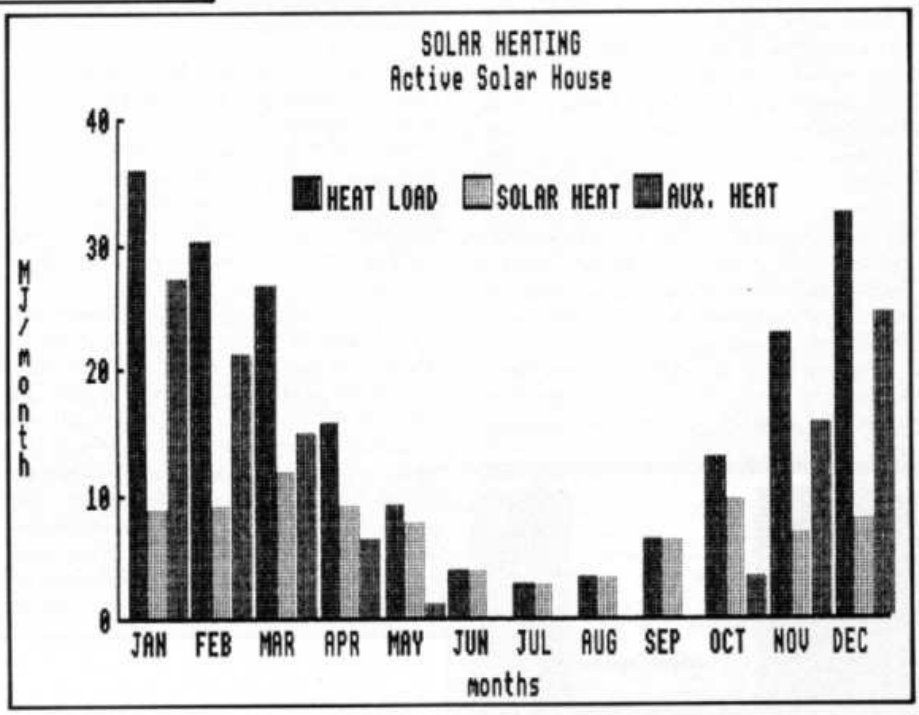
Bold, italic, and underline styles are controlled by "highlight" codes, much as in View – but there are now up to eight available. PD is able to display these on-screen, together with justification. Page breaks are also shown on screen, but only as single lines (like First Word Plus), and without headers and footers in place (as Inter-Word). However, this is sufficient to be regarded as WYSIWYG.

Like View, PD does not provide dynamic reformatting (as Wordwise and Inter-Word). While it word wraps (to the current format) as you add or insert text, it does not run back up if you delete text. Moreover, when copying, moving or deleting, blocks can only be marked as whole lines, hence you have to use *Split Line* before, and *Join Lines* after. This leads to a different way of moving short sections of text, involving part-lines. It is much easier to use *Delete word* repeatedly, or *Delete to end of slot* and then *Paste* to restore it. *Format paragraph* is usually needed to tidy up afterwards.

And now to the Spreadsheet

PD includes 49 spreadsheet functions – financial, mathematical, scientific, statistical, and trigonometrical. There are also full facilities for editing both individual expressions, and parts of the worksheet or model. By default, PD re-calculates the worksheet row-wise and automatically after every entry. These may be changed to column-wise and manual, if required. PD attempts to deal with any "forward references" by automatically re-calculating twice whenever a sheet is loaded, or a block of cells are replicated or deleted. This means that the worksheet is very likely to be showing the correct position at every stage, but it puts an additional premium on fast re-calculation.

PD is able to display spreadsheets with variable column widths. It is thus significantly better than ViewSheet – which uses the somewhat unfriendly multiple windows system. Although splitting the screen into windows is not possible in PD, you can fix columns and rows to the left and above any point on the sheet.



A modified chart returning active solar heating load and consumption ratios.

The Database

PD can be used to create, edit and access databases – of at least the "flat file", card index type. Five specifically database functions are provided, to extract information such as the *Sum*, *Average* or *Minimum* value of a "conditional list". In PD, searching starts from the top, regardless of where it is initiated.

When running on an Arc with a megabyte of RAM, PD could import only some 60K of a ViewStore file with 24 fields. (This is due to the way that the data is held). Clearly it can hold much larger datafiles when running on a 440. While searching the 60K in memory takes only 3½ seconds. I imported all 2006 records of the above ViewStore database into three multi-files using the partial load option. Searching for an entry in the last record took 32½ seconds using a floppy disc, and 25 seconds using a hard disc. Printing may also be conditional. Thus specific columns (fields) may be printed of those rows which satisfy a condition.

Ins and outs of it all

In addition to loading and saving files in its native "PipeDream" format, PD can also import and export files in so-called "Tab" format, in which the fields are separated by <Tabs>. Although Tab format contains no column widths, and no highlight or emphasis information, it allows PD to read and write files compatible with many Model B/Master applications. Even when set to Automatic, PD recognizes that they are in the Tab format.

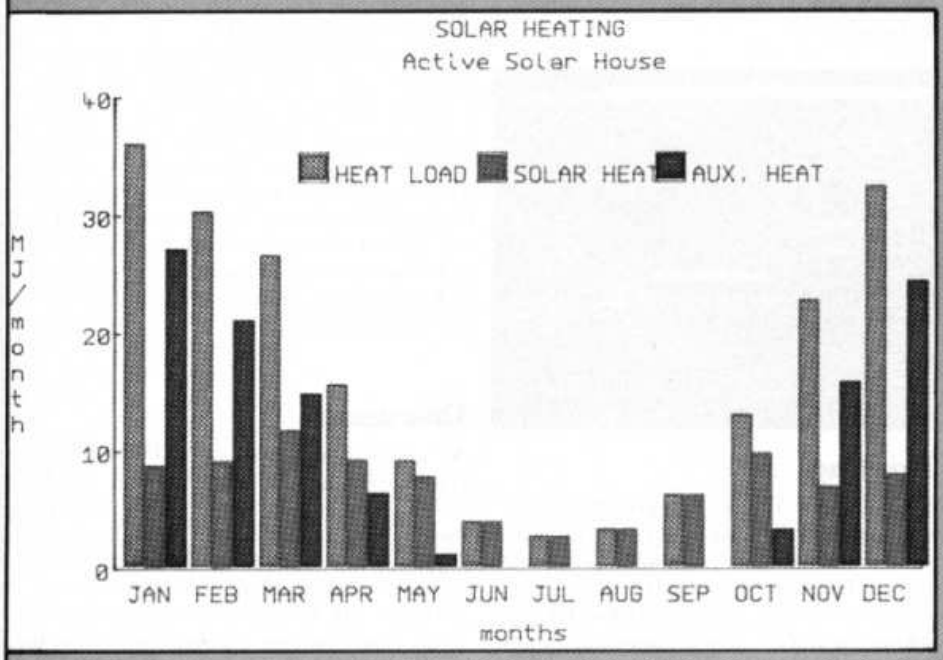
Files from View may be read that have been saved. Likewise, PD is capable of reading ViewStore files directly. Files from ViewSheet need a conversion utility, such as is provided with View Professional. Files from Inter-Word must be spooled, since those which are simply saved contain many embedded control codes. To transfer text from Inter-Word to PD, you first set the left margin to zero, and move the right margin correspondingly (to 71 for the default width), then turn paging off, and write it out as a spool file. This can then be read directly into PD. PD applies the left margin only when printing. Files from Inter-Sheet should be "Exported", with "Contents" to transfer expressions. Files from Inter-Base needs a conversion utility. In all those cases where text and data may be imported directly into PD, it may also be exported directly from PD – by saving the files in Tab format.

One of the most powerful features of PipeDream, which greatly extends its usefulness, is the ability to read and write Lotus 1-2-3 files – not just data, but also models. Moreover, this is built-in, rather than an external utility. This puts it ahead

of all other Arc spreadsheets. There are some functions of 1-2-3 which are not supported. Moreover, PD is not keystroke compatible with 1-2-3, and cannot run 1-2-3 macros. To test the ability to read and write its files, I took a model of some 26K, and transferred the .WKS file from DOS to ADFS with the GETFILE utility of the Arc PC Emulator. (I could equally well have used the corresponding utility supplied with the 80186). PD read it without any difficulty, though the translation is far from trivial. It ran just as well (but faster) in PD on the Arc, as it had in 1-2-3 on the 80186. You could contact Colton Software for assistance in transferring any data into PD.

Printing

Pre-defined printer drivers are supplied for the Epson FX-80 and for the Juki 6100 (which is a popular daisy-wheel printer). PD printer drivers consist of a simple text file, which may be edited in PD itself. For example, with Epson printers, the "form length" can only be set to 11 or 12 inches, whereas "true A4" paper is 11 2/3 inches long. However, it was very easy to delete the "form feed" from the printer driver, and select the modified driver to install it into PD. Then, with the page length set to 70 lines in PD, it printed perfectly. If you want to use the "short tear-off" feature of the Epson LQ-850, you should also add ESC "C" 70 to the "Printer On" string of the printer driver.



Plotted using the Plotmate Plotter, operation was quick and easy – with the correct drivers

Printing with a "parameter file" is very useful for mailshots, and indeed was even provided in View. However, where View supports up to only 10 "parameters", totalling 132 characters, and did no re-formatting, PD for the Arc supports up to 8191 parameters, with no limit on characters, and re-justifies the line for the actual string inserted.

Performance

The performance of PD and a number of other word processors is shown in Fig. 2. Looking at the crucial scroll test, PD PC is relatively slow even on the 80186 – though Word 3.0 and WordPerfect 4.1 on the IBM-PC are even slower.

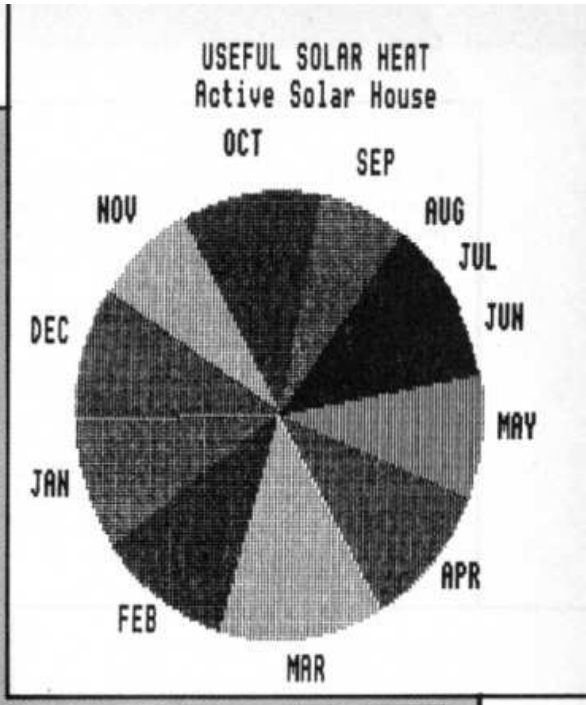
However, PD on the Arc is entirely acceptable, scrolling as fast as Inter-Word (which is my personal standard). It is thus some three times as fast as First Word Plus on the Arc (which I reviewed in A & B, 88/5). Indeed, PD on the Arc seems to handle generally as quickly as Inter-Word, and is completely free from overshoot. Moreover, among word processors for the Arc, PD shares with FWP the advantage over Inter-Word and Graphic Writer of being able to hold large documents in a single file, which makes searching and block moves much easier.

The performance of PD and a number of other spreadsheets is shown in Fig. 3. This shows several figures for the True Capacity of PD. In the case of PD on the the 80186, this depends directly on the amount of RAM. However, due to the size of the screen RAM, the operating system, and PD itself, the PC Plus upgrade increases it some 4.5 times.

In the case of the Arc, the True Capacity varies with the screen mode, but is is still very respectable when using Mode 20 to display 64 lines at once. The second set of figures ("Max") shows what can be achieved by PD in a 310 after running PC.PC (ie setting all "sizes" to the minimum, and unplugging all unnecessary modules). Thus on the 310, PD has a true capacity around three times as large as Logistix.

Looking at the crucial re-calculation speed, PD on the 80186 is adequate, in that it is some 70 per cent faster than 1-2-3 on an IBM-PC (but is still only half as fast as 1-2-3 on the 80186). However, on the Arc, PD really starts to fly – being some 4.5 times as fast as PD on the 80186. This makes it nearly twice as fast as Logistix on the Arc 310, and still 60% faster for the large models that the 440 allows. Moreover, PD has "smart recalculation".

This is not shown by the Liardet model benchmark results, but it can detect that expressions such as SIN(PI) are constant, so they need not be evaluated for second and subsequent re-calculations. The speed of re-calculation directly affects the feasibility of running large "models". Even if it is possible to load them, it is hardly acceptable if they take several minutes to re-calculate.



A modified chart returning active solar heating load and consumption ratios.

Documentation

Several pages of help are available on pressing f1, which explain the use of the menus, and list all the spreadsheet functions amd cursor commands. In addition, the menus are comprehensive, and so easy to access, that they act effectively as part of the "on-line help".

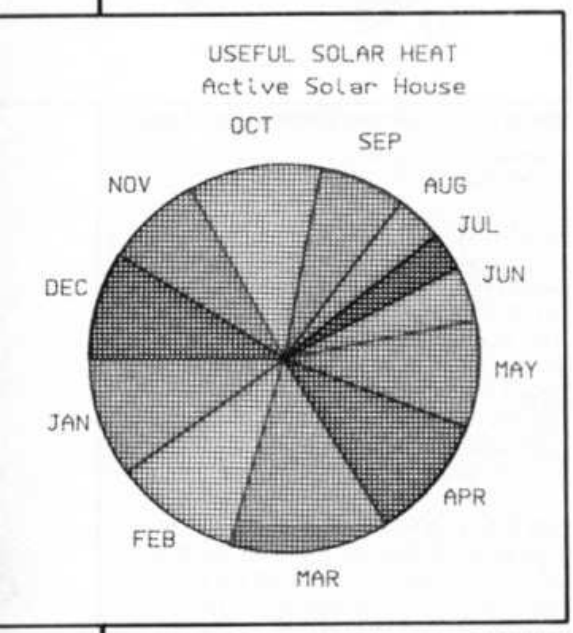
The manual is a model of its kind. It is just the right size, A5, with a lay-flat binding, and the pages and covers are of durable quality. The contents are just as good, being clearly printed and well-organized in three main sections – Getting Started, Using PipeDream, and Reference. Access to topics is aided by excellent Tables of Contents (for the three sections), and a comprehensive Index. Moreover, this splendid manual was edited, designed and laser-typeset by Colton Software themselves.

Presenter

Unlike Logistix, PD includes no facility for creating graphs, nor to embed them (or other pictures) in documents – as in First Word Plus, for example. Hence graphs have to be created in a separate package,

and printed on a separate page. However, this is often more satisfactory, since few printers are good at both text and graphics – except for "page" or laser printers, and even they usually lack colour.

Presenter, from Lindis International, is intended purely for the creation and editing of presentation graphics of business data. It has no calculation capability (even for transforming the data to logarithmic scales, as Inter-chart), nor can it apply statistical tests, or find lines which best fit the data. However, all these could be done in a spreadsheet (such as PD). Fortunately, PD can export data in a format (CSV) that can be read by Presenter. The best way of handling PD and Presenter is to put them on the same disc, since even the 800K of a floppy drive is ample to hold both, with plenty of room left for data.



The Same Pie Chart using the Plotmate drivers

Appropriately for a graphics package, Presenter uses the Arc windows, menus, and mouse-driven pointer. It can run in Mode 12 or Mode 20, and this may be changed from within the program (without affecting the data). This is convenient, since Mode 20 looks even better on screen, but the use of Mode 12 is advisable when dumping to printers, and is essential when saving graphs as sprites.

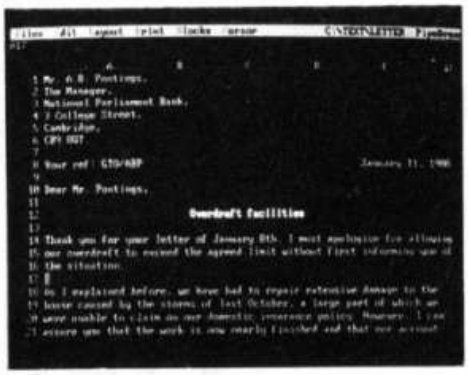
For testing, I used the same graphs as in my reviews of Inter-Chart, Words and Figures, and Ability. I first imported the data into PD from the 1-2-3-compatible files produced by WAF. I then exported these from PD in CSV format (putting the files in the directory GRAPHS. GRAPHDATA that is the default for Presenter). Then after starting up Presenter, and selecting "Catalogue" from the first menu, they could be loaded in the CSV format. Since I had arranged the data in horizontal rows in the spreadsheets, it was necessary to select "Horizontal" for loading into Presenter.

Presenter holds the data in up to 10 columns, each with room for 25 values. Each column is headed with a legend describing the values. The first column is set to receive "labels" by default, for plotting bar-, line-, and pie-charts, but can be set to "scaled" for numeric values, for plotting as X-Y graphs.

Fortunately, Presenter can import text or numeric "values" longer than 10 characters, though these then need to be edited to fit on the graphs. All the data exported to Presenter must consist of legends, labels and values, and not expressions (eg B1 – B5) – since these cannot be evaluated. However, PD makes this very easy to achieve, by allowing you to select "Snapshot" for a marked block – which substitutes a value for an expression. This is not stored with the model, and so does not change it permanently.

Up to five sets of dependent values can be shown on the same bar-chart – either side-by-side or as a 3-D (ie isometric) plot. Up to five separate lines may be shown on a line-graph, while any one of up to 10 sets can be plotted as a pie-chart.

Presenter provides reasonable defaults for every aspect of the three graph types – and menu options to allow many of them to be adjusted to suit a given case. These include the graduation values, the (up to eight) colours used, and the positioning of graphs, and the diameter of the pie. It is of course possible to set up a graph with your preferences, and (after clearing the data), save it under its own name as a "template" for future use.



Printing

Presenter has drivers for printing monochrome graphics (using patterns in place of colours) on the Epson FX-80 and compatible 9-pin dot-matrix printers, and in colour on the Integrex ColourJet 132 ink-jet printer. When selecting these drivers, Presenter offers the options of upright and sideways formats, centering and border. It also has drivers for the Linear Graphics "Plotmate" A4SM and A3M colour plotters. Presenter also allows graphs to be saved to disc (as sprites), for editing eg in Artisan, and incorporation in other word processors, such as First Word Plus.

Using the (now superceded) FX-80 printer, with the driver provided, the bar chart and pie chart each took about 9 minutes 45 seconds for the "portrait" (ie upright) style. The results show good grey tones, and high resolution, and this largely accounts for the time taken. Although the pies are not round, this is a shortcoming of the driver, rather than the printer. (See Figs. 4 and 5).

The Integrex can output to standard paper (eg for drafts) or to special "high quality" coated paper for the best appearance. Both are available in rolls, or as A4 cut sheets. It can also output to Over Head Projector film, which should be coated to suit the ink. Printing the bar chart and pie chart took only 6m each, and – given that they are dumps of the screen, and therefore have the same resolution – the images produced are excellent. Although sideways images take more paper, they are no larger. (See Figs. 6 and 7).

The Plotmate plotters can output either onto paper (preferably glossy), or onto OHP film, by using pens with appropriate inks. For use with Presenter, they should preferably be fitted with the multi-pen attachment, to avoid the need for frequent manual pen-changing. Plotmate plotters are marked with a sequence of 10 pen colours (0 to 9), which inevitably differ from the palette of 16 colours (0 to 15) used by Presenter.

However, to make the colours plotted match those on screen, you should install the pens in the multi-pen attachment (or supply them manually !) in the sequence used in the Presenter palette. Thus, for the default settings, the text, and axes [etc] are in palette colour 7, which is black, which should be put in pen stall 7.

The palette sequence should then be followed, with green in stall 9, and then from the top, with yellow in stall 0, down to blue in stall 5. Since black is used also as a bar or pie-slice colour, you must either put a second black pen in stall 4, or change the bar colour setting in Presenter from 14 to 7. When output to the Plotmate A4SM with multi-pen attachment, the bar chart took some 20m, and the pie chart 14m. (See Figs. 8 and 9).

Discussion

As an integrated package, PD has more commands than a single-purpose application. However, this is offset by the menus and help system, and the commands are of course consistent across the several functions. Again as an integrated package, PD is somewhat larger than a given single-purpose application – which means that the document or sheet size is potentially smaller. Against this, PD allows the creation of "cleverer" documents, with individual "live" expressions, and complete "live" tables (or "models") embedded in the text.

As one of a family, PD can move data (text complete with all formatting information, numbers complete with "model" expressions) between the various versions, but they all handle in much the same

fashion. Hence PD may be used almost interchangeably on the Model B/Master, the Z88, the PC and clones (including the 80186 co-processor), and now the Arc.

However, those who experience it on the Arc will be pretty dissatisfied with the others. In addition to the colours and screen resolution, PD on the Arc enjoys more speed and true capacity than on a PC (and far more than on a Z88 or Model B/Master). Although, when running PD, a PC with a 20 Mhz 386 processor may match the Arc for speed, it cannot match even a 310 for capacity. PD is priced at £99 plus VAT, for the Arc and the PC versions.

PD on the Arc may be compared with Inter-Word and Inter-Sheet from Computer Concepts. These have been available for some time , but as well as being limited in speed and document size by running under the 6502 Emulator, the need for a ROM/RAM podule (and hence a backplane) makes them more expensive. Against that, they will run in a 305, and SpellMaster is already available. (Colton expect to offer a spelling checker for PD later this year. This will be available both separately, and together with PD).

First Word Plus is more graphic-oriented than PD, and requires the use of a mouse. However, perhaps as a consequence, it is much slower. Impressive as is Logistix on the Arc when compared to other spreadsheets on 16-bit PCs, PD allows much larger models, and they can be recalculated in only about the same time. Moreover, PD can read and write data and models from 1-2-3 and compatibles (such as Words and Figures). I also find PD to be significantly faster than Sigma-Sheet, which I expect to review shortly.

Presenter is priced at £24.95, plus VAT, and is available only for the Arc.

Conclusions

PipeDream offers word processing, spreadsheet, and database functions in one package, and draws on all the experience gained with View, ViewSheet, and ViewStore. It is therefore the natural successor for those who have previously used the View family. It will also appeal to users of View Professional on the Model B/Master, and of PD on the Z88.

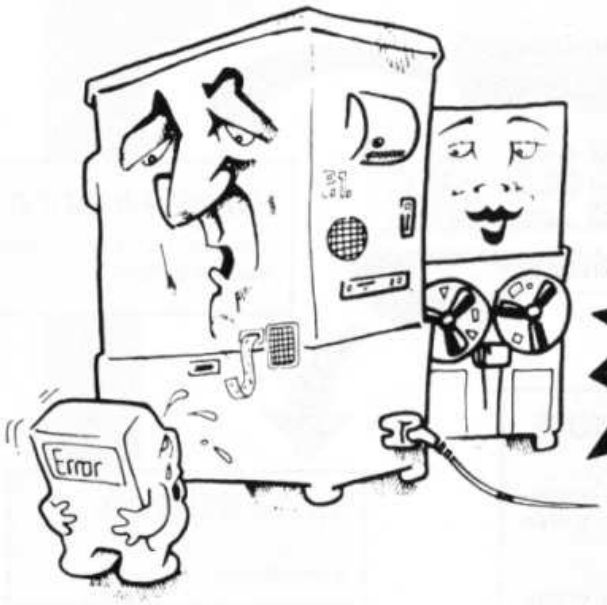
These users will be pleased at its familiar "feel", while at the same time taking full advantage of the speed, capacity and screen modes of the IBM-PC, and particularly the Arc. PD on the PC has far more competition, and has to be compared with packages such as "Words and Figures", and "Ability", both of which are about the same price, and have some performance advantages.

Conversely, PD is the fastest handling large document word processor available for the Arc, and the fastest calculating spreadsheet. The database facilities support mail shots and more.

Presenter is the first stand-alone business graphics package for the Arc, and is thus the "perfect partner" for PD. With the four "productivity" functions covered by PipeDream and Presenter, this could be all the software that you need buy for your Arc – though this would be to leave much of its potential untapped !

Factfile

- **Colton Software are at: Broadway House, 149-151 St. Neots Road, Hardwick, Cambridge, CB3 7JQ. ☎ 0954-211472.**
- **Lindis International are at : P.O. Box 10, Halesworth, Suffolk, IP19 0DX. ☎ 0986 85-476.**
- **Solidisk Technology Ltd are at : 17 Sweyne Avenue, Southend-on-Sea, Essex, SS2 6JQ. ☎ 0702-354674.**



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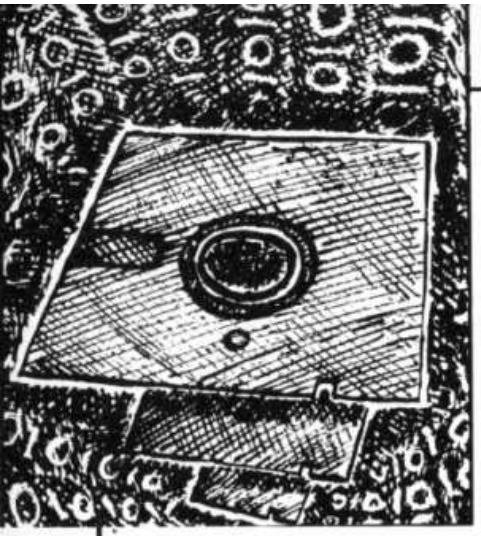


ARCHIMEDES BUSINESS ROUNDUP

Applications

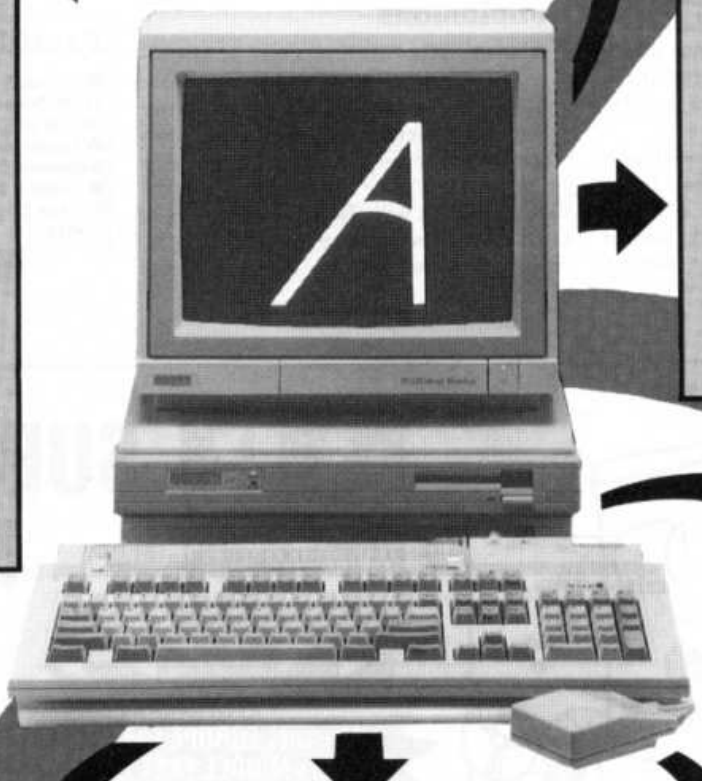
Supplier: Minerva
Nominal ledger
Order Processing
Sales Ledger
Purchase Ledger
Stock Management
School Administrator

Databases

Supplier: Clares
Alphabase
Supplier: Minerva
Deltabase – card index, non WIMP.
System Delta Plus – window environment and multi-tasking features.
Exports to Systems Gamma and Sigma. Programmable.
Reporter
Mailshot
Supplier: Mitre Software
Flying Start II – file and mailing list management

Integrated Software

Supplier: Colton Software
Pipedream – wordprocessor with spreadsheet and database facilities
Supplier: Acornsoft
Logistix – spreadsheet with time management and database facilities



Home Finance

Supplier: Contex Computing
Bank Manager

Graphs/Charts

Supplier: Minerva
GammaPlot

Wordprocessors

Supplier: Clares
GraphWriter – can incorporate graphics within documents
Supplier: Acornsoft
1st Word Plus – full WYSIWYG and professional printer support

Spreadsheets

Supplier: Minerva
SigmaSheet

FACTFILE

Acornsoft ☎ 0933 228953
Clares ☎ 0606 48511
Colton Software ☎ 0954 211472
Computer Concepts ☎ 0442 63933
Contex ☎ 023 03 347
Minerva ☎ 0392 37756
Mitre Software ☎ 01 283 4646

Harvey Coleman – Managing Director of Acorn Computers Ltd – Bringing the BBC Micro ethos kicking and screaming into the 1990's?

Archimedes Means Business

ARCHIMEDES: WILL IT DO FOR BUSINESS?

The Archimedes, in the business computing marketplace, bears a strange resemblance to the *Beeb* history. Although the present four-megabyte top limit of the *Archimedes* 440 is enough for most small business applications and technically no reason to prevent expansion up to 16 megabytes and beyond as the processor is capable of addressing no less than 64 megabytes! In software the situation is partially reminiscent of the early days of the Beeb. The last two issues of *A&B Computing* have described superb software, the equal to anything available to business PC users throughout the world, running fast and sublimely on Archimedes.

But one excellent spreadsheet and one excellent word processor does not constitute a software range. The statement, in an Acorn marketing glossy about the Archimedes 4-40 that "Readily available software for Archimedes includes spreadsheets, business graphics, database and accounting systems" is, I suspect, a little premature.

Acorn tell me they have a list of 200 business applications for the Archimedes but have not, of course, checked them all. Acorn have also made it plain that they regard any interpretation of "business software" as meaning "office automation software" as far too narrow. In the 200 packages are functional packages that might only be appropriate to specialist types of business.

Just as second processors came to the rescue of the *Beeb*, so the *MS-DOS emulator* enables the *Archimedes* to run the great pool of *MS-DOS* software, albeit in a slow and rather drab fashion, until a decent software library is available. I describe the performance of the emulator later in this article. However *MS-DOS* is an operating system for the 1980s, not for the 1990s. The last decade of the century looks likely to be dominated by two operating systems: *OS-2* and *UNIX*.

BASIC 5 – Acorn's Secret Weapon

By offering *BASIC 5*, which is not only much more flexible than the old *BBC BASIC* but also runs exceptionally fast, the ability to write their own software or, at least configure existing software to their own needs, is put in to the hands of the business person with a minimum programming capability. Although I predict that such people will find the *UNIX* shell (command line interpreter and simple programming language) far easier to use.

The trouble is that *BASIC* may be very popular among *BBC* and home and educational users but it is very unpopular among serious software houses. Almost all serious applications software development nowadays is being done in *C, C++, Ada* (for defence applications) or *Prolog* (for artificial intelligence). However *Archimedes* does at least offer a *C* compiler for those willing to tackle the much more daunting task of learning *C* programming.

Software for the 1990s – OS-2

OS-2 is the chosen operating system for the new generation of IBM micros: the *PS/2* range. It will not run on the lowest Model 30 but is standard for the 50, 60 and, 80 based on the *Intel 80286* and *80386* processors. It is a single-user operating system, it has only just arrived, little software has yet been written for it, many people feel that it will offer substandard performance (Compaq are offering an advanced operating system which already claims to out-perform it) and IBM is visibly losing its power position in the small-business micro market. *Presentation Manager* the "user-friendly" "front-end" to *OS-2* could even be strangled at birth by contentious law suits between Apple (who claim it copies the *Macintosh*) and MicroSoft who wrote it for IBM. It's anyone's guess whether *OS-2* will ever achieve the dominance that *MS-DOS* had achieved

Jon Vogler

by the mid point of the eighties. That leaves *UNIX*.

UNIX

When I first started writing about *UNIX*, there was much scepticism; this was all very well for the data processing departments of medium sized companies, with powerful mini computers, but not really relevant to a magazine about micros. How wrong that view has proved! All the former doubts, as to whether *UNIX* would ever become a commercial operating system, have now disappeared and the size of computer that is running a *UNIX* like operating system is decreasing steadily. Even IBM are hedging their bets by offering their own version (*AIX*) to run on the higher range *PS/2* series And more and more big customers and policy makers are specifying *UNIX* as the required operating system (including, in the world of education, the Scottish Council for Educational Technology, who regard *UNIX* as the basis of their long term strategy).

Where Does Acorn Stand: The Present

I talked to Michael Page, Acorn's Corporate Communications Manager, about how Acorn see the situation. This is the picture he painted. Many people are discontented with the *MS-DOS* business computing environment. To the basic hardware you have to add additional colour cards and graphics cards. There is a now severe memory limitation and the whole system runs slowly. The Archimedes, which has been shipped in volume since the end of September 1987, opens up new business opportunities.

Michael Page – Acorn's Corporate Communications Manager "well aware of the public's discontent with MS-DOS applications.

The range starts at under £1,000 and, with an emulator costing only £99.00 (£60.00 if you buy it bundled with an Archimedes 310) it can run the full range of *MS-DOS* software". However the days of the stand-alone business PC are numbered. After the early excitement that each individual executive could have computing power on the desk, and could develop their own applications using *DBase III* or *Lotus 1-2-3*, without tedious waits and restrictions imposed by some central data-processing bureaucracy, the view is changing. The centralised data-processing department system ensures consistency throughout the firm; every computer-user able to read and write files from every other computer-user, bulk purchasing discounts on hardware and software and the integration of data, from department level up to company level, to streamline the processing of cost, inventory and budgetary material.

So centralised business computer systems are back; but with a difference. Instead of the user being restricted to a dumb terminal, only able to run whatever programs the central data-processing king permitted, users now want a powerful, independent "work-station" on their desk, providing them with local processing and (if they wish and are capable) programming power, yet access to central computer data files and programs, maintained secure and in good order by a specialist department.

Archimedes, concludes Mr Page, is fast, powerful, excellent at handling full-colour, high-resolution graphics, with a professional quality keyboard and good communications capabilities. It is modestly priced, so it is uniquely suited to playing that workstation role. However, if Archimedes is to be more than just a terminal its ability to run mainstream business programs is important and this is provided by the *MS-DOS* emulator with the promise of better things to come. Originally a hardware emulator was planned: a "podule" containing an *Intel 80186* chip, that could be slotted into one of the four free racks on the Archimedes 400 range.

However, as an interim measure, the software emulator was written and Acorn were pleased with the speed it achieved: it runs only slightly more slowly than does a standard IBM-PC and the view was, as a stop gap measure, this would be acceptable to many users. Rather than invest time and effort in the *186 Podule* it seemed more logical to concentrate resources on developing a Podule with an *80286* or even the latest *80386* chip, which would run not only *MS-DOS* but also *OS-2*. However to date Acorn tell me they have taken no decision to go ahead with either of these. Acorn also understand that third party peripheral developers are considering what co-processor podules they might produce. It is wait and see if Archimedes will ever run *OS-2* and, no doubt, Acorn are themselves waiting to see whether *OS-2* is going to be the resounding flop that many people are predicting or whether IBM's huge marketing power will rescue it from disaster. With *UNIX*, Acorn have no such hesitation.

They state that they are committed to *UNIX* as the strategic operating system for Archimedes and intend to release a *UNIX* work-station at the end of 1988, details of which will be published in the second half of this year. The plan is that Archimedes should be a vehicle that will provide *UNIX* more cheaply than anyone else, even Atari, and that the power of the Archimedes RISC chip will overcome many of the problems of slow performance that *UNIX* suffers when running on conventional hardware.

Does it make sense? Remembering the Beeb's long success as a combined local computer and terminal to mainframes it probably does, in technical terms and, in industry that worries about costs much less than does the educational market, an Archimedes at a little over £1,000 is a sensible alternative to either a dumb terminal at £400 to £500 or a modern, powerful *80386*-based PC from IBM or Compaq at £2000 to £3000 (to say nothing of a Sun workstation at £15000 to £20,000!).

The main pitfall is that other manufacturers are not standing still. Low-cost *UNIX* machines are likely from Amstrad, Commodore, Apricot and Atari, while the latter are launching the *Abaq* with parallel processors, which will make even Archimedes look like a tortoise. However a lot of product development will be needed before these become practical realities, so Acorn **might** keep ahead, depending on how quickly and how effectively they get *UNIX* up and selling.

Which UNIX?

The next question is, which *UNIX* will Archimedes run? The theory of *UNIX* is that it is a "unified standard" and that anything that complies with it will run on any machine. Hollow laugh! In practice there are innumerable different versions such as *XENIX, LYRIX, AIX, Berkeley-4.2 (and now 4.3)* as well as a whole series of official *UNIX* versions from AT&T (Bell Telephone Co, who invented *UNIX* and hold ownership rights), of which the latest is *UNIX System V.3.*

However there is a powerful world-wide movement to bring all these divergent *UNIX* streams together. Among the important initiatives to this end are: This is AT&T's own definition of what a true version of *UNIX* must comprise before it may be called *UNIX*. Only AT&T and their subsidiary Olivetti (and let us not forget that Acorn is now partially owned by Olivetti) are actually permitted to use the name *UNIX*.

It seems likely that Acorn will in fact be

more interested in *Berkeley 4.3*, the latest version of *UNIX* from the University of Berkeley, in California, where the operating system is fine tuned by a powerful concentration of boffs, who do not know much about business needs but have more in common with Acorn's traditional educational market than the rather bureaucratic and commercial people in AT&T.

System V.3 of course complies with *SVID* and strenuous efforts are being made to bring *Berkeley 4.3* and *System V.3* closer and closer together (and closer, too, to *Xenix* the MicroSoft version of *UNIX)*. This is a standard laid down by the American Institute of Electrical and Electronic Engineers (strongly backed by the world's largest computer customer: the American government) to assess the various *UNIX* look-alike operating systems and the British Government has tended to show interest, although not with the same promptitude and fervour as the Americans.

It seems more likely that institutional and governmental customers will, in future, specify compliance with *POSIX* than with *SVID*. With so much of Acorn's market being in the public educational sector, conformity with *POSIX* would seem to be essential. This is a group of computer manufacturers who have agreed to try and make their whole array of computing systems: not just the operating system but hardware, communications, software, media (disks and tapes) and the like, all interchangeable. So it defines not only what form of *UNIX* but what kind of floppy disk, what communication protocols and connections; which wire should go where on an RS-232 and all the rest.

Their most glorious moment was a demonstration at the Hanover Computer Fair, a year or so back, when a single program *(20/20 spread-sheet)*, in its source code form, was handed to each *X/Open* member firm on a single flopp disk to compile it and demonstrate that it would run on their own machine. All members completed the demonstration successfully; the age of truly portable *UNIX* is on its way, but cannot be said to have arrived until the same firms can demonstrate total disk compatibility; where you can take a floppy or tape bearing the compiled program and run **that** in any machine. However it certainly represents progress.

Windows and Nets

Windows is a standard for windowing applications: not only for *UNIX* but other operating systems as well. It is becoming widely adopted and any manufacturer, of a windowing micro such as the Archimedes, who is planning to go for *UNIX* ought to be aiming to comply with it. Again the implication is that software which complies with *X-Windows* standards will be much cheaper to "port" onto machines that run under these standards and it is in complying with this kind of standard that Acorn will find their problems of shortage of software resolved.

There is now a substantial body of good *UNIX* business software around, but, as Torch have found, software houses will only pay for it to be ported (a process that may take many man-weeks to configure a big suite onto non-compatible hardware) if the hardware supplier can demonstrate that an attractive number of his machines are installed on business customers' premises, just waiting for the right software package to become available. If not, then the hardware supplier may have to pay the porting costs and will save money if, due to having standardised, porting only takes an afternoon!

Another important standard, for a manufacturer aiming to offer a work-station linked to more powerful computers, is networking capability. Archimedes at present has the Beeb's famous and successful Econet and Acorn say it also has "potential for *Ethernet*" (the most widely used "local area networking" system, produced by Xerox. However a new networking standard is emerging for *UNIX* computers: *NFS* or *Network File System* from Sun.

In fact AT&T produced their own networking standard, called *RFS*, but *NFS* has proved more popular. At last year's *European UNIX Show* a number of exhibitors (including Torch) connected their totally different machines with *NFS*. At the bottom of each screen was a thin strip, across which a minute greyhound raced, one screen at a time. Accompanying text told the viewer on which stand it was running at any moment and a friend and I were sufficiently sceptical to check it out, waving to each other across Olympia! I have to acknowledge it worked. The latest irony in this strange computer world is that AT&T, attracted by Sun's success in work-station technology, have joined forces with them, which probably ensures the eventual death of *RFS* and success of *NFS*. There is no doubt; *Archimedes* will **have** to run *NFS* to achieve its position as a communicating work-station and powerfully intelligent mainframe terminal.

I do not want to scare the band of *UNIX* programmers that Acorn has recruited but the above are but a few of the requirements that *Archimedes* is going to have to satisfy if it is to succeed in the *UNIX* market. One source of comfort is that the need to develop both *OS-2* and *UNIX* may be receding. Bill Gates is boss of Microsoft, developers of OS-2 for IBM. Microsoft has (only partially successfully) been producing its own *XENIX* variant of *UNIX* for some years). Gates has stated that he sees the natural future as convergence between *OS-2, XENIX* and UNIX. Heaven!

Will Archimedes Go Multi-User?

UNIX has succeeded largely because it is a multi-user operating system: whether you have one or a hundred terminals connected into your *UNIX* computer, provided it has sufficient power, memory and disk capacity and provided some users are willing to wait a bit while the processor satisfies others, then all can use the same computer and, subject to security precautions, access the same disk files. This is ideal for business: many people in different departments need access to the same information and, by having that information on a single disk drive you ensure that everyone uses it in its most up-to-date form.

This used to be less essential in small businesses but, as the computer is used for more and more tasks, inside and outside the main office, this is changing. There is some equivalence between multi-user and multi-tasking computing and Archimedes, with its windowing display, is clearly a multi-tasker. So is it logical to assume that the *UNIX* Archimedes machine will support multiple users. Acorn will not say but my guess is not; one of the problems with *UNIX* is the size of the file system and, to keep costs down, Acorn will undoubtedly hope to make it runnable on a 20 Mbyte disk drive, of which a good ⅔ of the space needs to remain available for applications programs and data files.

Essential capabilities such as net working and windowing all take up extra space and Acorn will be looking for what they can leave out. Initially, if they see their market as their present users wanting to expand **upwards** to *UNIX*, rather than the present small business *UNIX* community wanting to save costs by coming **downwards**, a sensible first step will be to concentrate on single-user machines.

The PC-Emulator

How good is the PC-Emulator; if you had to use it for a year or so, while waiting for better software running under Arthur, waiting for *OS-2* on a *386 Podule* or waiting for *UNIX* , could you put up with it? The emulator comes as two ¾ inch disks, plus a **very** slim handbook. The first, emulator, disk is of course an ADFS disk and it should boot simply by inserting it, pressing <SHIFT/BREAK>. Mine did not; I had to open the disk icon and go down two directory levels before I found an executable file that would run it. I had similar trouble when I first ran *First Word Plus* and Acorn sent me a new disk that worked correctly.

Accordingly I rang them and discovered I had been sent an early version of the product. The latest version is 1.20 which accompanies *MS-DOS Version 3.21*. You cannot tell the version by looking at the disk itself but check the copyright page of the handbook and if you have issue 2 (1988) all is well. If you have issue 1 (1987), return it. All the emulator disk does is preliminary activities, prior to loading the *MS-DOS* disk, which you have to do before you can use an applications program. So there is quite a lot of disk swapping, unless you're hard disk based. One important aspect of using a hard disk machine is that you can partition the disk and have half of it for your *MS-DOS* programs and half for ADFS programs.

It is all very slow! To format a single floppy disk takes three minutes sixteen seconds and of course you get less than three quarters of a megabyte, compared with the 800K you get if you format a disk as ADFS which takes a third as long: only sixty-five seconds. Secondly you lose all the glorious colour of the normal Archimedes display; you might think this does not matter; most *MS-DOS* software dates from the times when all businesses used monochrome monitors.

However, unless you are using a medium- or high-res monitor the screen display is definitely rather blurry. This, generally lower, performance is evident in such matters as copying disks: with a single disk system I had to do six insertions in order to duplicate an *MS-DOS* disk. To be practical, you can't really run the emulator productively on a single disk machine. Take the *DIR* command (the *MS-DOS* equivalent of *CAT) which should give you a list of the files on your disk. If you run it on its own, then it scrolls off the top of the screen, unless you are quick enough at typing CTRL-S to stop it.

The answer is to use the *MS-DOS* "pipe" facility (borrowed from *UNIX*) and pipe the output of DIR into the command MORE (also borrowed from *UNIX*) which delivers the output, comfortably, one screen at a time. The trouble is that MORE is not written into the *MS-DOS* core system; it lives, as a separate command file, on the *MS-DOS* disk.

Most users will want to be able to do more than merely list the files on the *MS-DOS* operating system disk but there is no way of putting MORE into memory so that you can use it with any other disk. I tried getting over this by asking it to read a directory of "disk B", hoping that it would then tell me to "Insert a new diskette and strike any key". It duly did so but, when I struck the key, instead of reading that directory it changed its mind and asked me to insert the diskette for drive A and strike a key.

This waltz went on for some time and got rather boring! Since writing this I have tried it with the version 1.20 Emulator and all works well.

Similar problems apply to many of the other useful operating system commands, like SORT or the line editor *EDLIN*; you simply have to have a two-floppy system or a hard disk. I found that some commands would not work correctly if the disk is write-protected. For example again, piping DIR through MORE, the system would not even read its own *MS-DOS* system disk if that bore a write-protect tag; quite inexplicable, because both commands need only to read not write the disk.

Acorn have explained this to me. The MS-DOS pipe is not accomplished in memory (as with a true UNIX pipe); instead the output from the first command is written to a temporary file which is then read by the second command. Obviously this will not work if you cannot write the temporary file. Another drawback of the system is that, even though you can run both operating modes on the same disks, you cannot switch anything except straight ASCII files between the two. For example, you cannot transfer *Logistix* files, produced under *MS-DOS* to *Logistix* running under *Arthur*

However, on the new issue *Emulator* a pair of commands: *PUTFILE* and *GETFILE*, will transfer files between ADFS and *MS-DOS*. However there are problems with running these on a single-floppy machine; you have to create a "RAM disk"; a portion of memory that behaves as a disk drive. Another reason for using a twin floppy or hard disk if possible.

Apart from this *MS-DOS* still has most of the limitations we are all familiar with. Nor are these facilities made more usable by Acorn's pathetic little *PC-Emulator* handbook, which summarises a dozen *MS-DOS* commands without making any attempt to provide full explanations or to explain such horrors as the use of *EDLIN* the *MSDOS* line editor.

The only feature I did like, is that the emulator gets over the horrid lack of a copy key on PC-compatibles: function key F1 copies the previous command a single character at a time and function key F3 gives you the whole lot at one go, which can then edit. However even the editing is rather funny; the DELETE key does not delete but the left arrow key does. You cannot move the cursor through the text and edit at will, so there is much retyping. Oh! for *UNIX* on which I can repeat any of the last hundred or so commands and edit them at will!

PC-Emulator: Conclusion

The *PC-Emulator* on Archimedes is slow and dull, contains bugs and requires at least two disk drives to run comfortably. Also you must remember that not all *IBM-PC* software is as readily available on 3½" floppy disks as on 5"; check that you can get the software you want in this form before you commit yourself. If you just need it for occasional use it will get you by; for regular use you will feel very frustrated at how the computing power at your finger tips has been down-graded.

In my view Acorn would do well to develop that *386 Podule* and fast! However, help is at hand in the form of a remarkable suite of *MS-DOS* programs that convert *DOS* to almost behave like *UNIX*. They have just been issued on 3½" floppies and I have been testing them on Archimedes but am waiting for Acorn to send me a hard disk before I can really put them through their paces.

Conclusion

If you want a computer for your business, should you buy an Archimedes? My answer is: only if there are special benefits, which are not available on computers that run a wide range of software faster. For example, in the fields of sound and graphics, Archimedes is certainly going to offer benefits to specialised users, not least of which will be the ability to do complex graphical things, faster than other computers currently available and much faster than any others in the price range. If that is the major purpose of your computer, and you just need a bit of subsidiary word-processing or accounting for a few hours a week, Archimedes now is just adequate (if you can find the right accounting package) and, in a year's time, will probably be more than sufficient.

For use as a primary business computer however the benefits of high speed and excellent graphical display and the ability to write your own programs in *BASIC 5* do not really compensate for the shortage of business software running under *Arthur*, the sluggish performance of IBM-compatible software running under the emulator and the considerable delay inevitable before Acorn have a *UNIX* system fully running and de-bugged. However let us not forget that the Beeb was in a similar position four years ago yet many people have excellent business use from it.

Archimedes

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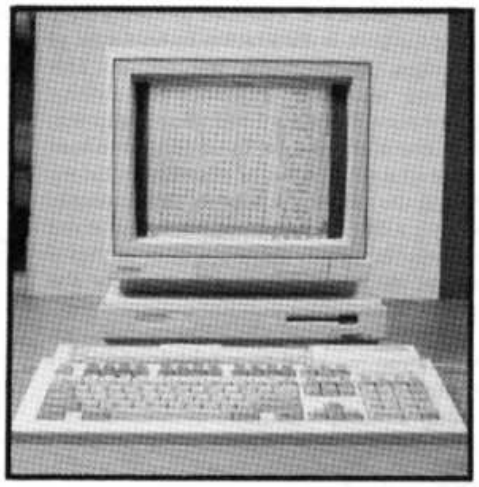

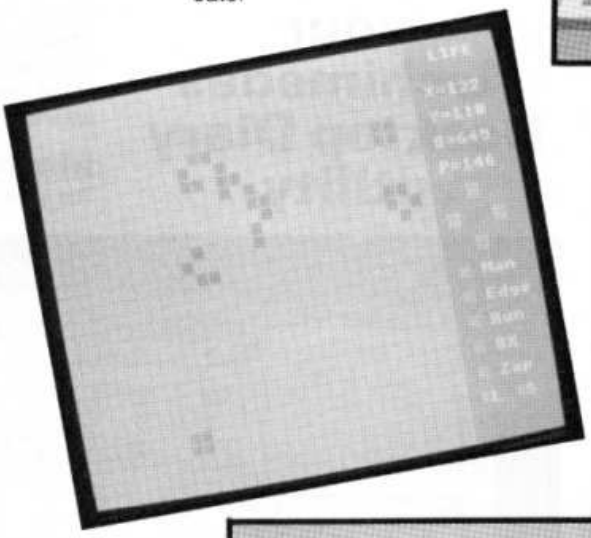

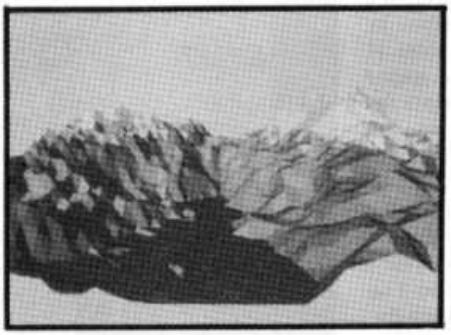

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Desktop Diary

Rick Hughes

Add to the usefulness of your Archimedes Desktop Diary utility

One of the first things you notice about the Archimedes is the desktop feature – hardly surprising as the machine arrives configured to display it at switch-on. This includes several useful items the busy executive might have on his desk (anyone designed a Times crossword icon, yet?) to help him go about his everyday work.

Applying the principle that "if you pay for it you should use it" I decided to keep a diary using the built-in diary facility to hold a list of birthdays, appointments and so on. This worked well until I needed to extract information. Knowing I had an appointment, but unsure of the date, I was obliged to load up several days-worth of information before finding the relevant reference. Unfortunately, loading a diary file does not mark days in the calendar for which there are diary entries – out of this inconvenience the need for the present utility arose.

This program will allow you to display on the screen (or send to a printer) the diary contents for any whole month, thus providing a handy reminder of the month's appointments.

Diary data

Before we can write a program to analyse the diary file, we need to know what the format of that file is. This can be done by saving entries for Jan 1st, Jan 2nd, Dec 31st and then *DUMPing the resulting diary file. The outcome of this exercise was that each day is allocated 184 bytes in the file and entries are pre-filled with "return" codes – ie CHR$13's. Thus if we know what day of the year we require it is a simple matter to find the data for that day setting PTR (BASIC's random-access file pointer) to 1 + 184*(day-1) and then reading in 184 bytes.

The remainder of the program is concerned with outputting the information in a suitable format and grouped together by months. Conveniently, there are at most 31 days in any month and the screen can display up to 32 lines – a header plus one line per day - this is too good an opportunity to miss and so we use Mode 0 to display the information.

The number 184 mentioned above is crucial to the working of this program and it is assigned to the constant *Diary–Entry–Size* early in the program. The current year is extracted from TIME$ and assigned to *Year* and the diary file is opened for reading; here I am assuming that the file name is "diary1988", (or whatever the year is by the time you read this) – this would be the default unless you overrode it. If you require your diaries to have some other name then you should amend line 170.

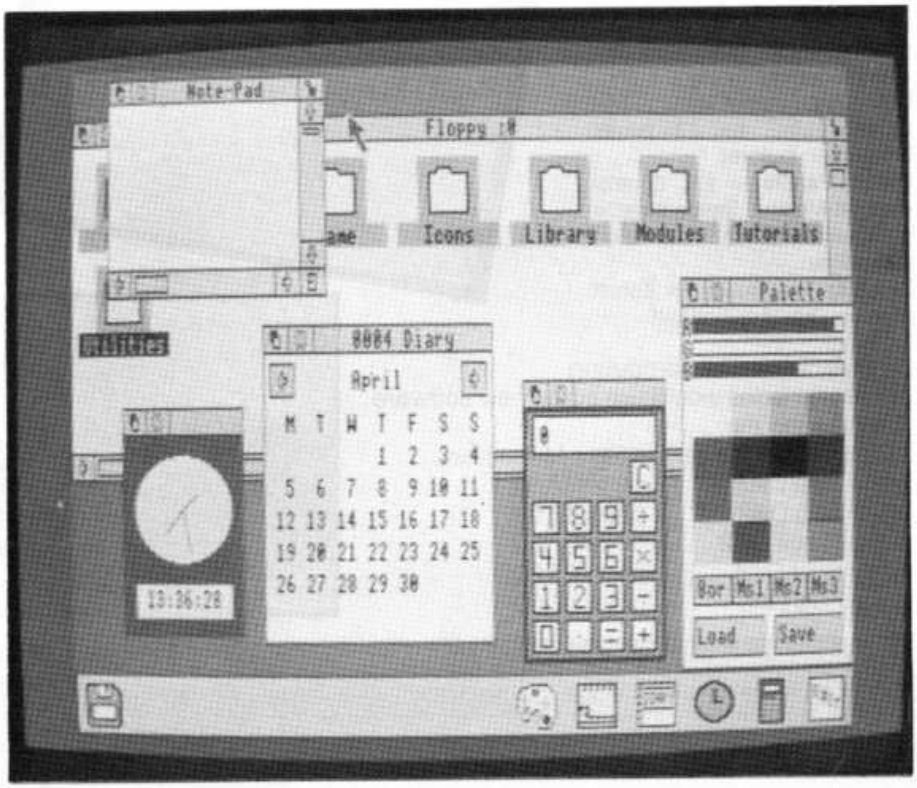
Once the month and printer status have been selected as described in the next section, the main business of the program starts. Using a "Thirty-Days-Hath-September" table, the first day of the month is adjusted to day-within-year and assigned to *Day%* at line 500; this is needed so that the file can be read from the correct starting point. The main printing loop occupies lines 590-720 and is fairly straight forward; it achieves the following:

i) Leading CHR$13's are stripped from daily entries.

ii) Printing starts with the first non-CHR$13 character.

iii) Subsequent CHR$13's are compacted and replaced by a single space character.

iv) As much data is possible is output without spilling over the end of a line. Thus very long entries are abbreviated (unless you are printing).



Add to the desktop our useful diary utility integrate it into your working environment

That's magic

One point of interest is the way in which Day/Month/Year information is converted to a day name; this being handled by the routine *Aday*. This neat little algorithm is well-known to magicians who can calculate the day of the week for any date this century in only a few seconds. If you study the routine closely you should be able to do so, too – for further details see Martin Gardner's book Mathematical Carnival. Although this routine is only needed once (to calculate the first day of the month) it is more convenient to call it once for each day.

Month Planner

The program should be saved in the same directory as the diary file you wish to study and a failure to find this file will result in swift program termination. Once the file has been opened, it will remain open until the program is ended with "ESCAPE".

Initially the month "January" is shown; to cycle through the months hold down the <Spacebar> until the required month

is displayed at the prompt, then press <RETURN>. Similarly, use the <Spacebar> to select the printer option "Yes" or "No". Note that if you select "Yes" the computer will assume that a printer is connected and may appear to hang-up (it hasn't, really) if one is not connected. After the page has been displayed, pressing any key will clear it and return you to the month-selection prompt.

This is only a simple routine, but it is a great asset when used in conjunction with the desktop diary, making this facility much more usable. Certainly it does all that I would require of it, but amendments are possible – for example, the ability to access different diaries or to format the print in different ways. Ambitious programmers might like to read the whole diary file at once and produce a calendar for the whole year, rather than just one month, thus providing a "year-planner".

Rick Hughes has a fascination for prime numbers and a very warm Archimedes from all the programming he puts in. His LIFE appeared in the June issue of A&B Computing.

♦ EXAMPLE ♦

```
Appointments for March,1988

T     1  Scored over 1900 on Z
arch - everyone's dead jealous
!
W     2
T     3  Got A&B computing - g
reat program by  Rick Hughes t
his month.
F     4
Sat   5  Went to see 'The Pira
tes of Penzance' at the Arts C
entre
Sun   6
M     7
T     8
W     9
T     10  Picked up 2 tickets t
o Des O'Connor gig in April.
F     11  Turned down offer of
50 quid for Des O'Connor ticke
ts.
Sat   12
Sun   13
M     14  Jeff's Birthday party
 - managed to stay sober.
T     15  Woke up with lousy ha
ngover - maybe I wasn't THAT s
ober.Rain all day
W     16
T     17
F     18  Shortlisted for MBE f
or services to computing.
Sat   19
Sun   20  Took car for service
- mechanic said last rites wou
ld be more appropriate.
M     21
T     22  Another installment p
aid off for Archimedes.
W     23
T     24  Zarch top score up to
 2600!!!!!!
F     25
Sat   26
Sun   27  Wrote brilliant video
 game - eat your heart out, DB
!
M     28  Video game hung up Ar
c - can't switch it off.

T     29  Arc overheating badly
.
W     30  Can brew tea on CPU.
Still looping.
T     31  Fixed Arc using A-lev
el physics notes. Abandoned vi
deo game for now.
```

♦ LISTING I ♦

```
   10REM >Appoint
   20REM (C)A&B COMPUTING 1988
   30
   40*KEY 1 EDIT:M
   50ON ERROR GOTO 1100
   60MODE 0
   70OFF
   80@%=2
   90DIM day$(6),Month$(12)
  100FOR I%=0 TO  6:READ day$(
I%):NEXT
  110FOR I%=1 TO 12:READ Month
$(I%):NEXT
  120
  130Diary_Entry_Size=184
  140Year=VALMID$(TIME$,12,4)
  150Leap_Year=((Year AND 3)=0
)
  160
  170file$="diary"+STR$(Year)
  180X%=OPENIN(file$)
  190REM Check if file present
  200M=BGET#X%
  210
  220REPEAT
  230 CLS
  240 PRINT"Appointments for Y
ear ";Year
  250 PRINT TAB(1,3)"Diary for
 month:"'
  260 Mon%=1
  270 PRINT TAB(18,3)Month$(1)
  280 REPEAT
  290  G%=GET
  300  IF G%=32 THEN
  310     Mon%=1+(Mon% MOD 12)
  320     PRINT TAB(18,3)Month
$(Mon%);"      "
  330  ENDIF
  340 UNTIL G%=13
  350
  360 PRINT TAB(1,5)"Send to p
rinter?"
  370 print=TRUE
  380 PROCtoggle
  390 REPEAT
  400  G%=GET
  410  IF G%=32 PROCtoggle
  420 UNTIL G%=13
  430
  440 Day%=0
  450 RESTORE 1070
  460 FOR I%=1 TO Mon%
  470  READ Days_This_Month
  480  Day%+=Days_This_Month
  490 NEXT
  500 Day%-=Days_This_Month
  510 IF Mon%>2 AND Leap_Year
THEN Day%+=1
  520 PTR #X%=1+Day%*Diary_Ent
ry_Size
  530 IF Mon%=2 AND Leap_Year
THEN Days_This_Month=29
  540
  550 IF print VDU 2
  560 CLS
  570 PRINT"Appointments for "
;Month$(Mon%);","Year
  580 IF print PRINT
  590 FOR Day%=1 TO Days_This_
Month
  600  PROCAday(Day%,Mon%)
  610  IF Day%>1 PRINT
  620  PRINT Day_Of_Month$"  "
Day%;"  ";
  630  start=FALSE : dgot=FALS
E
  640  FOR I%=1 TO Diary_Entry
_Size
  650   B%=BGET#X%
  660   IF B%=13 THEN
  670       IF start PROCretur
n
  680   ELSE
  690       IF B%>31 AND B%<12
7 PROCletter
  700   ENDIF
  710  NEXT
  720 NEXT
  730 IF print PRINT
  740 VDU 3
  750 *FX 15
  760 G%=GET
  770UNTIL FALSE
  780
  790DEFPROCtoggle
  800  print=NOT print
  810  IF print PRINT TAB(18,5
)"Yes" ELSE PRINT TAB(18,5)"No
 "
  820ENDPROC
  830
  840DEFPROCreturn
  850 IF NOT dgot PRINT " ";
  860 dgot=TRUE
  870ENDPROC
  880
  890DEFPROCletter
  900 start=TRUE
  910 IF COUNT<78 PRINT CHR$B%
; ELSE IF print PRINT'TAB(9)CH
R$B%;
  920ENDPROC
  930
  940DEFPROCAday(D,M)
  950 Y=Year-1900
  960 D+=VALMID$("144025036146
",M,1)
  970 D+=(Y DIV 12)+(Y MOD 12)
+(Y MOD 12) DIV 4
  980 IF Leap_Year AND M<3 D=D
-1
  990 Day_Of_Month$=day$(D MOD
 7)
 1000ENDPROC
 1010
 1020DATA Sat,Sun,"M  ","T  ",
"W  ","T  ","F  "
 1030DATA January,February,Mar
ch,April,May,June
 1040DATA July,August,Septembe
r,October,November,December
 1050
 1060REM Thirty days hath...
 1070DATA 31,28,31,30,31,30,31
,31,30,31,30,31
 1080
 1090REM Error handling
 1100ON ERROR OFF
 1110ON
 1120VDU 3
 1130CLOSE #0
 1140IF ERR=222 PRINT'"Diary f
ile not found":END
 1150REPORT
 1160PRINT " at ";ERL
 1170END
```

CMOS – RAM EDITOR

Dave McLaughlin

This program has been kept simple by breaking it up into procedures, thereby allowing you to make use of the routines in your own programs if required.

Why?

This program was created because at some time or other you, or a program you have bought, has changed the configuration of your machine. True? Well this little program will help you to change it back to what it was. You can also configure a series of settings and save these to disc. You can then call them up at any time.

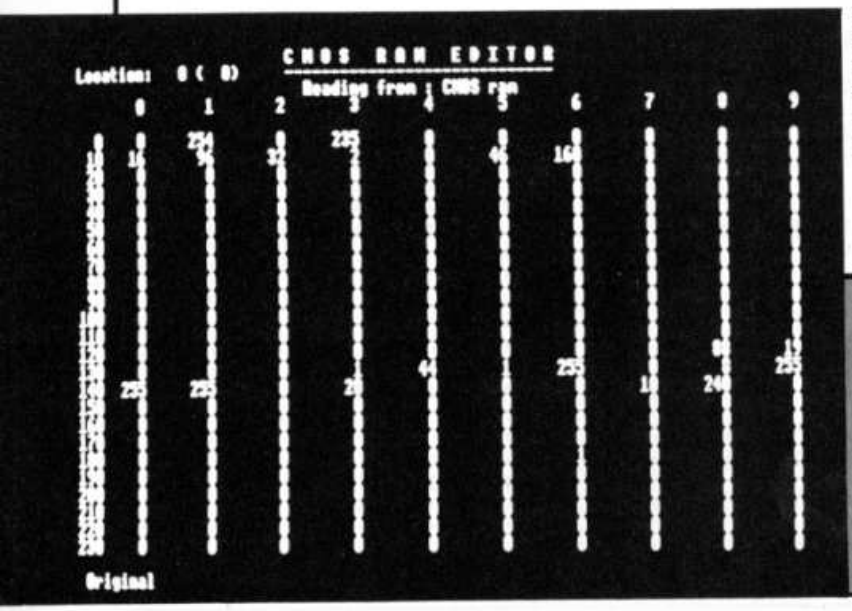
This may sound like a hard task, but just ask yourself this: *how many times have you been fed up changing everything with *CONFIGURE each time you wanted a different setup?* With this program you only have to do it once then each time you need the configuration you just load it.

The program itself may appear large but this is because it contains a large amount of error checking. I also hate the command GOTO, so have used REPEAT UNTILs with flags being set to indicate if things are OK or not. This can be seen within the program. Anyway who uses GOTOs on a machine like the Archimedes with the power and structures of BASIC 5?

Below is a list of the procedures and a description of each. You may find that you can use these in your own programs to configure the settings automatically when the program runs.

With the *CMOS RAM editor* you can display and edit the contents of RAM as well as save, load and compare disc based data

CMOS RAM EDITOR
(c)D.McLaughlin
1) Read from CMOS RAM
2) Write current values to CMOS RAM
3) Save CMOS RAM values to disk
4) Load CMOS RAM values from disk
5) Continue editing of data
6) Compare CMOS RAM with a File
7) Instructions for use
8) EXIT program



The CMOS RAM Editor in action – it is easily operated by a series of menus. It comes ready for you to access the depths of your Archimedes!

By procedure

PROCreadCmos reads the contents of the RAM using the OSBYTE call 161. This returns the value of the location held in R1, and returns it in R2. The data is held in the array cmos%() and is also saved to array save%().

PROCwriteCmos writes the data held in array cmos%() to RAM. This uses OSBYTE 162 with the location in R1 and the data in R2. The data is still in the array, and therefore can still be edited, if required.

PROCsaveCmos saves the data to disc, with a user supplied filename or the default (CMOSRAM). It also tests if the file exists already and prompts for overwrite.

PROCloadCmos is the opposite of saveCmos. This only loads into the array cmos%(), and not to RAM.

PROCshowCmos displays the array cmos%() on screen for editing.

PROCedit uses the cursor keys for moving around. Pressing the <Spacebar> allows you to change the data. Pressing <RETURN> or <ESCAPE> takes you back to the menu. Pressing the R key will reset the RAM to the last set of data read or saved to RAM. This allows you to abort any changes since the last operation.

PROCinstructions displays the instructions for use.

PROCcompare displays a prompt to load a file, then reads the data from RAM also. When displayed the differences will be coloured magenta.

FNinput uses OS–ReadLine to get data from the user with a specified maximum length.

Below is a short list of the RAM locations. A full description can be found in the *Programmers Reference Manual.*

Where to get the Disc

Available only from A&B Computing as part of the Red Keys series of discs – see our ad in this section.

Location use

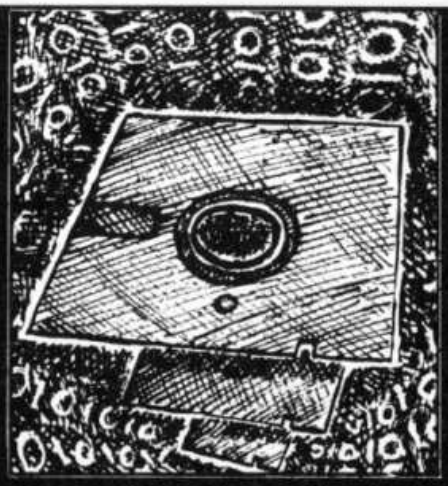
0 Econet station number	46-111 Application use
1 Econet file server station number	112-127 Operating system use
2 Econet file server net number	128-129 Current year
3 Econet printer server number	130 Last month
4 Econet printer server net number	131 Its already been a leap year flag
5 Default filing system	132-148 Flags and data for *STATUS and *CONFIGURE (see manual)
6-9 Acorn use	149-152 BASIC editor use
10 Screen info	153-184 System use
11-13 Keyboard info	185-186 *STATUS and *CONFIGURE data
14-15 Printer info	187-239 System use
16-29 Acorn use	
30-45 Reserved for the user (you)	

Programming the ARM's floating point facilities

Last month I introduced the ARM instruction set and showed that although it is reduced, *its instructions are very flexible and powerful. Comparing it with the 6502 of the earlier BBC micros, I find it easier to program. However, there is one area in which both processors are lacking – they have no floating point capability.*

To use floating point arithmetic on the 6502 machines you had two choices. The first was to write your own routines – not a trivial task! Alternatively, you could hunt around in memory for BASIC's internal routines and call those. This was not good practice and could not be relied upon, since the routines tended to be at different addresses in the different versions of BASIC.

The Archimedes is better served in this respect, and this month we are going to look at how it handles floating point.



PROGRAMMING THE ARM

Paul Fellows

The floating point co-processor and emulator

A fundamental part of the design of the ARM chipset is that it will allow a hardware floating point unit to be added via the *co-processor interface*. Such a unit is being designed and will one day appear! This poses a problem. How can we write our software so that it works today and will automatically take advantage of the hardware when it arrives?

Fortunately Acorn have thought of this one and provided a very neat solution.

The answer lies in the floating point emulator module provided with every machine. This emulator gives you all the functionality that the hardware co-processor will provide. You can use all the floating point instructions now and the software emulator will deal with them. Later, when your software is run with the co-processor, the emulator will be redundant – the hardware will execute the instructions directly and with much greater speed.

How the software emulator works

When the ARM comes across an instruction which it does not recognise it generates an exception (a severe form of error). This will usually result in the message *undefined instruction* being reported on the screen. However, when the floating point emulator is present, the operating system calls it before reporting the problem. This gives the floating point emulator software the opportunity to check whether or not the instruction is one that it recognises. If it is a floating point instruction, then the emulator executes it in the same manner that the co-processor would have if it had been present. Finally, having obtained the result, the emulator returns control to the original program which continues on, blissfully unaware that anything unusual has happened.

The floating point instruction set

The (notional) floating point processor is similar to the ARM processor. It provides eight floating point registers called F0 – F7. All of its instructions are 32 bits long and can be executed conditionally.

The floating point instructions fall into five classes. A complete list is given in table 1.

The FP processor understands numbers stored in four different formats. These are single precision, double precision, extended precision and packed decimal. Since single precision will be sufficient for most applications this is used in the following examples and hence the *S* suffix to the opcodes is used throughout the rest of this article. To use the other formats (for higher precision) one of the other suffixes must be used instead. These are given in Table 4.

Table 1 - Floating point instruction set

Simple arithmetic instructions		Code	Result of opcode Fd,Fn,Fm
ADF	Add	00000	Fd = Fn + Fm
SUF	Subtract	00100	Fd = Fn - Fm
RSF	Reverse subtract	00110	Fd = Fm - Fn
MUF	Multiply	00010	Fd = Fn * Fm
DVF	Divide	01000	Fd = Fn / Fm
RDF	Reverse divide	01010	Fd = Fm / Fn
POW	Power	01100	Fd = Fn to the power of Fm
RPW	Reverse power	01110	Fd = Fm to the power of Fn
RMF	Remainder	10000	Fd = remainder of Fn / Fm
FML	Fast multiply	10010	Fd = Fn * Fm
FDV	Fast divide	10100	Fd = Fn / Fm
FRD	Fast reverse divide	10110	Fd = Fm / Fn
POL	Polar angle	11000	Fd = Arctan (Fn / Fm)
Single operand arithmetic instructions		Code	Result of opcode Fd,Fm
MVF	Move	00001	Fd = Fm
MNF	Move negated	00011	Fd = -Fm
ABS	Absolute value	00101	Fd = ABS (Fm)
RND	Round to integral value	00111	Fd = integer value of Fm
SQT	Square root	01001	Fd = square root of Fm
LOG	Logarithm to base 10	01011	Fd = log10 of Fm
LGN	logarithm to base e	01101	Fd = loge of Fm
EXP	Exponent	01111	Fd = e to the power of Fm
SIN	Sine	10001	Fd = sine of Fm
COS	Cosine	10011	Fd = cosine of Fm
TAN	Tangent	10101	Fd = tangent of Fm
ASN	Arc sine	10111	Fd = arc sine of Fm
ACS	Arc cosine	11001	Fd = arc cosine of Fm
ATN	Arc tangent	11011	Fd = arc tangent of Fm
Comparisons		Code	
CMF	Compare floating	100	
CNF	Compare negated floating	101	
CMFE	Compare floating with exception	110	
CNFE	Compare neg floating " "	111	
Load/Store			
LDF	Load		
STF	Store		
Conversions			
FLT	Integer to floating point		
FIX	Floating point to integer		

Simple arithmetic instructions

Probably the simplest FP operation is adding two numbers. For example:

ADFS F1, F2, F3

ADFS stands for ADd-Floating Single-precision (not to confused with the Advanced Disc Filing System in this case!). This instruction takes the numbers in registers F2 and F3, adds them together and puts the result in F1.

This is typical of many of the arithmetic instructions which take two operands in registers and produce their result in a third register. For example, multiplication is supported.

MUFS F1,F2,F3

multiplies the contents of the registers F2 and F3 together and puts the result in register F1.

Alternatively the second operand can be one of a number of special constants. These are listed in table 2. For example:

MUFS F1,F2,#3.0

multiplies the contents of the register F2 by 3.0 and puts the result in F1.

With the multiply and add instructions the order of the operands doesn't matter since, for example, 1.5 * 2.3 = 2.3 * 1.5 and 1.5 + 2.3 = 2.3 + 1.5 etc. However, with some other instructions the order does matter, for example, 2.3 – 1.5 is not the same as 1.5 – 2.3. Table 1 shows affect of performing each of the operations with Fd as the destination register, Fn as the first operand and Fm as the second operand. For example:

SUFS F1,F2,F3

subtracts the contents of F3 from F2 and places the result in F1.

Single operand arithmetic instructions

There is a second class of instructions which operate on just one value to produce a result. For example the square-root instruction

SQTS F0,F2

calculates the square-root of the number in F2 and puts it in F0.

This class of instructions contains all the trigonometric instructions (SIN, COS, TAN etc) and all the Logarithm instructions (LOG, LGN, EXP).

Comparisons

The only floating point instructions which affect the flags are the comparison instructions. (Unlike the ARM itself, the FP arithmetic instructions do not have the option to affect the flags.)

There are two pairs of comparison instructions CMF & CNF and CMFE & CNFE. The first member of each pair compares the contents of the first register with the contents of the second. The second member compares the contents of the first register with the negated contents of the second. For example:

CMFS F1, F2

subtracts the contents of F2 from the contents of F1 (F1 – F2) and sets the flags depending on the result obtained. Whereas

CNFS F1, F2

subtracts the negated contents of F2 from the contents of F1 (F1 – -F2 i.e. F1 + F2) and uses this result to set the flags.

The major difference between the two pairs is how they are used. CMF/CNF should be used before a test for equality, i.e. EQ or NE. CMFE/CNFE should be used for all other tests e.g. GT, GE, LT, LE etc.

Flags and condition codes

As I said at the beginning, all FP instructions can be executed conditionally, just like those of the ARM. This is specified using the same two-letter codes. These are listed in table 3. The two-letter codes should be placed immediately after the standard opcode, before the precision letter. For example:

CMFES F1,F2

ADFGTSD F2,F2,#1.0

compares the values in F1 and F2. If F1 is greater than F2 then the addition instruction is executed and F2 is increased by 1.0.

Rounding

In general, the floating point instructions operate to more bits of precision than is needed and then round the number down to the number of bits required. There are four different rounding methods to choose from which are given in table 4, along with some examples.

The default is *round to nearest*. For all the instructions met so far, the other methods can be chosen instead by adding the letter P, M or Z after the precision letter. For example:

ADFEQSZ F1, F2, F3

adds together the contents of F2 and F3, provided that the zero flag is set, rounds the result towards zero and places it in F1.

Table 2 - Immediate constants

Constants	Code
0.0	000
1.0	001
2.0	010
3.0	011
4.0	100
5.0	101
0.5	110
10.0	111

Even in their most compact form (single precision), floating point values occupy 32 bits. Since an entire floating point instruction has to fit into the same space, there is no way in which these instructions can handle general constants. However, the eight values listed above were felt to of such importance that they have had codes assigned to them so that they can be used in arithmetic, comparison and FLT instructions.

Table 3 - Condition codes

Letters	Flags	Description	Code
AL		Always	1110
CC	c	Carry clear	0011
CS	C	Carry set	0010
EQ	Z	Equal	0000
GE	NV or nv	Greater than or equal	1010
GT	NVz or vcz	Greater than	1100
HI	Cz	Higher unsigned	1000
LE	Nv or nV or Z	Less than or equal	1101
LS	c or Z	Lower or same unsigned	1001
LT	Nv or nV	Less than	1011
MI	N	Negative	0100
NE	z	Not equal	0001
NV		Never	1111
PL	n	Positive	0101
VC	v	Overflow clear	0110
VS	V	Overflow set	0110

NZCV mean that the flags must be set and nzcv mean that they must be clear

Table 4 - Precision and Rounding methods

Precision	Letter	Code	Size	Exponent	Mantissa
Single	S	00	4 bytes	8 bits	23 bits
Double	D	01	8 bytes	11 bits	52 bits
Extended	E	10	12 bytes	15 bits	63 bits
Packed decimal	P	11	12 bytes	16 bits	76 bits

Rounding method	Letter	Code	2.77	-2.77
Round to nearest		00	2.8	-2.8
Round to +ve infinity	P	01	2.8	-2.7
Round to -ve infinity	M	10	2.7	-2.8
Round to zero	Z	11	2.7	-2.7

The last 2 columns show the results when the numbers 2.77 and -2.77 are rounded to 2 significant figures by the different methods.

Table 5 - Bit formats

Arithmetic instructions

```
 31..28 27..24 23..20 19  18..16 15  14..12 11...8  7  6..5  4    3  2..0
+------+------+------+---+------+---+------+------+---+----+---+---+------+
| Cond | 1110 | abcd | e |  Fn  | j |  Fd  | 0001 | f | gh | 0 | i |  Fm  |
+------+------+------+---+------+---+------+------+---+----+---+---+------+
```

Cond	= condition code	(table 3)
abcdj	= opcode	(table 1)
ef	= precision	(table 4)
gh	= rounding mode	(table 4)
Fd	= FP destination register	
Fn	= FP operand register (or 000 for single operand)	
i	= 0 if Fm used 1 if immediate value used	
Fm	= FP operand register or immediate value	(table 2)

Comparisons

```
 31..28 27..24 23.21 20  19  18..16 15.......8  7  6..5  4    3  2..0
+------+------+-----+---+------+----+----------+---+----+---+---+------+
| Cond | 1110 | abc | 1 | e |  Fn  | 11110001 | f | gh | 1 | i | 1 |  Fm  |
+------+------+-----+---+------+----+----------+---+----+---+---+------+
```

Cond	= condition code	(table 3)
abc	= opcode	(table 1)
ef	= precision	(table 4)
gh	= rounding mode	(table 4)
Fn	= first FP register	
i	= 0 if Fm used 1 if immediate value used	
Fm	= second FP register or immediate value	(table 2)

Load / Store

```
 31..28 27.25 24  23  22  21  20  19..16 15  14..12 11...8 7.....0
+------+------+---+---+---+---+---+------+---+------+------+-------+
| Cond | 110  | P | U/D | e | W | L/S |  Rn  | f |  Fd  | 0001 | Offset |
+------+------+---+---+---+---+---+------+---+------+------+-------+
```

Cond	= condition code	(table 3)
P	= 1 for pre-index addressing 0 for post-index addressing	
U/D	= 1 for positive offset 0 for negative offset	
ef	= precision	(table 4)
W	= 1 for write-back 0 otherwise	
L/S	= 1 for LDF 0 for STF	
Rn	= ARM base address register	
Fd	= FP source/destination register	
Offset	= absolute value of offset	

Conversions

```
 31..28 27.....21 20  19  18..16 15..12 11...8  7  6..5  4    3  2..0
+------+---------+---+---+------+------+------+---+----+---+---+------+
| Cond | 1110000 | j | e |  Fn  |  Rn  | 0001 | f | gh | 1 | i |  Fm  |
+------+---------+---+---+------+------+------+---+----+---+---+------+
```

Cond	= condition code	(table 3)
j	= 0 for FLT 1 for FIX	
ef	= precision	(table 4)
gh	= rounding mode	(table 4)
Rn	= ARM register	
Fn	= FP register for FLT 000 for FIX	
i	= 0 if Fm used for FIX 1 if immediate value used for FIX	
Fm	= FP register or immediate value for FIX 000 for FLT	(table 2)

Load and Store

So far we have not said anything about how to get data in or out of the registers. This is accomplished using the LDF (LoaD Floating) and STF (STore Floating) instructions. These all require a base address for the memory location which is given in an ARM register. For example:

LDFS F0,[R1]

loads a single precision value pointed to by the address held in the ARM register R1 and places it in F0.

These instructions are similar to the BASIC assembler's LDR and STR instructions which were described last month. They support both pre-index addressing (where another value is added to the contents of the address register before it is used as the address to load from/store to), and post-index addressing (where the contents of the address register are used unaltered to load from/store to but have another value added after this). For example:

LDFS F0,[R1,#4]

is an example of pre-index addressing. It loads the value from the contents of R1 + 4. If the square brackets had been followed by an exclamation mark then the address actually used (R1 + 4) would have been written back to R1, whereas:

LDFS F0,[R1],#4

is an example of post-index addressing. The address used is given solely by the contents of R1, which subsequently has the offset 4 added to it.

The amount of memory which a floating point number occupies when it is stored depends on the precision of the number. Since the formats used to hold the different precision numbers are different, it is important that a value stored with a particular precision is read in again with the same precision, otherwise the value read will be meaningless. For simplicity examples given here use solely single precision.

Conversions

FLT and FIX allow values to be passed between the floating point system and the ARM processor. FLT converts an integer value held in an ARM register to a floating

Listing 6 - Floating point macros

```
1000 DEFFNcopdt(opc$,cc$,prec$,Fd$,
     Rn$,offset$,p$,w$)

1010 LOCALword%,temp%
1020 REM CC is bits 31,30,29,28
1030 IFcc$="" cc$="AL"
1040 temp%=INSTR("EQ,NE,CS,CC,MI,PL,
     VS,VC,HI,LS,GE,LT,GT,LE,AL,NV",cc$)-1

1050 IF temp%<0 ERROR"Bad condition code"
1060 word%=word% OR ((temp% DIV 3)<<28)
1070 REM Bits 27,26,25 are 110
1080 word%=word% OR (&110 << 25)
1090 REM Bit 24 is PRE or POST indexing
1100 IF p$="POST" word%=word% OR (0 << 24)
1110 IF p$="PRE"  word%=word% OR (1 << 24)
1120 REM Bit 23 is U/D
1130 IF SGN(VALoffset$)<>-1 temp%=1
     << 23  ELSEtemp%=0
1140 word%=word% OR temp%
1150 REM Bit 22 is Y and
     bit 15 is X (the precision)
1160 CASE prec$ OF
1170 WHEN "S" :temp%=(0<<22)+(0<<15)
1180 WHEN "D" :temp%=(0<<22)+(1<<15)
1190 WHEN "E" :temp%=(1<<22)+(0<<15)
1200 WHEN "P" :temp%=(1<<22)+(1<<15)
1210 OTHERWISE ERROR "Bad precision"
1220 ENDCASE
1230 word%=word% OR temp%
1240 REM Bit 21 is Wb
1250 IF w$="!" temp%=1<<21 ELSEtemp%=0
1260 word%=word% OR temp%
1270 REM Bit 20 is L/S
1280 CASE opc$ OF
1290 WHEN "LDF" :temp%=1<<20
1300 WHEN "STF" :temp%=0<<20
1310 OTHERWISE ERROR "Unknown opcode"
1320 ENDCASE
1330 word%=word% OR temp%
1340 REM Bits 19,18,17,16 are Rn
1350 temp%=EVAL(Rn$) << 16
1360 word%=word% OR temp%
1370 REM Bits 14,13,12 are Fd
1380 temp%=EVAL(Fd$) << 12
1390 word%=word% OR temp%
1400 REM Bits 11,10,9,8 are 0001
1410 word%=word% OR (&0001 << 8)
1420 REM Bits 7,6,5,4,3,2,1,0
     are ABS(offset)
1430 temp%=ABS(VAL(offset$))DIV4
1440 word%=word% OR temp%
1450 [OPTopt%
1460  EQUD word%
1470 ]
1480 ="
2000 DEFFNcoprt(opc$,cc$,prec$,
     round$,Fn$,Rn$,imm$,Fm$)
2010 LOCALword%,temp%
2020 REM CC is bits 31,30,29,28
2030 IFcc$="" cc$="AL"
2040 temp%=INSTR("EQ,NE,CS,CC,
     MI,PL,VS,VC,HI,LS,GE,LT,
     GT,LE,AL,NV",cc$)-1
2050 IF temp%<0 ERROR"Bad condition code"
2060 word%=word% OR ((temp% DIV 3)<<28)
2070 REM Bits 27,26,25,24 are 1110
2080 word%=word% OR (&1110 << 24)
2090 REM Bits 23,22,21,20 is abcL/S
2100 CASE opc$ OF
2110 WHEN "FLT" :temp%=&0000
2120 WHEN "FIX" :temp%=&0001
2130 WHEN "WFS" :temp%=&0010
2140 WHEN "RFS" :temp%=&0011
2150 WHEN "WFC" :temp%=&0100
2160 WHEN "RFC" :temp%=&0101
2170 OTHERWISE ERROR "Unknown opcode"
2180 ENDCASE
2190 word%=word% OR (temp% << 20)
2200 REM Bit 19 is e and bit 7 is f
2210 CASE prec$ OF
2220 WHEN "S" :temp%=(0<<19)+(0<<7)
2230 WHEN "D" :temp%=(0<<19)+(1<<7)
2240 WHEN "E" :temp%=(1<<19)+(0<<7)
2250 WHEN "P" :temp%=(1<<19)+(1<<7)
2260 OTHERWISE ERROR "Bad precision"
2270 ENDCASE
2280 word%=word% OR temp%
2290 REM Bits 18,17,16 are Fn
2300 temp%=EVAL(Fn$) << 16
2310 word%=word% OR temp%
2320 REM Bits 15,14,13,12 are Rn
2330 temp%=EVAL(Rn$) << 12
2340 word%=word% OR temp%
2350 REM Bits 11,10,9,8 are 0001
2360 word%=word% OR (&0001 << 8)
2370 REM Bits 6,5 are gh
     (rounding mode)
2380 CASE round$ OF
2390 WHEN "" :temp%=&00
2400 WHEN "P":temp%=&01
2410 WHEN "M":temp%=&10
2420 WHEN "Z":temp%=&11
2430 OTHERWISE ERROR
     "Bad rounding mode"
2440 ENDCASE
2450 word%=word% OR (temp% << 5)
2460 REM Bit 4 is 1
2470 word%=word% OR (1<<4)
2480 REM Bit 3 is 1 (Reg/value)
2490 IF imm$="#" temp%=1 ELSEtemp%=0
2500 word%=word% OR (temp%<<3)
2510 REM Bits 2,1,0 are Fm
2520 temp%=EVAL(Fm$) << 0
2530 word%=word% OR temp%
2540 [OPTopt%
2550  EQUD word%
2560 ]
2570 ="
3000 DEFFNcopdo(opc$,cc$,prec$,
     round$,Fn$,Fd$,imm$,Fm$)
3010 LOCALword%,temp%
3020 REM CC is bits 31,30,29,28
3030 IFcc$="" cc$="AL"
3040 temp%=INSTR("EQ,NE,CS,CC,MI,
     PL,VS,VC,HI,LS,GE,LT,GT,LE,
     AL,NV",cc$)-1
3050 IF temp%<0 ERROR"Bad condition code"
3060 word%=word% OR ((temp% DIV 3)<<28)
3070 REM Bits 27,26,25,24 are 1110
3080 word%=word% OR (&1110 << 24)
3090 REM Bits 23,22,21,20 are opcode
3100 CASE opc$ OF
3110 WHEN "ADF" :temp%=&0000:temp2%=0
3120 WHEN "MUF" :temp%=&0001:temp2%=0
3130 WHEN "SUF" :temp%=&0010:temp2%=0
3140 WHEN "RSF" :temp%=&0011:temp2%=0
3150 WHEN "DVF" :temp%=&0100:temp2%=0
3160 WHEN "RDF" :temp%=&0101:temp2%=0
3170 WHEN "POW" :temp%=&0110:temp2%=0
3180 WHEN "RPW" :temp%=&0111:temp2%=0
3190 WHEN "RMF" :temp%=&1000:temp2%=0
3200 WHEN "FML" :temp%=&1001:temp2%=0
3210 WHEN "FDV" :temp%=&1010:temp2%=0
3220 WHEN "FRD" :temp%=&1011:temp2%=0
3230 WHEN "POL" :temp%=&1100:temp2%=0
3240 WHEN "MVF" :temp%=&0000:temp2%=1
3250 WHEN "MNF" :temp%=&0001:temp2%=1
3260 WHEN "ABS" :temp%=&0010:temp2%=1
3270 WHEN "RND" :temp%=&0011:temp2%=1
3280 WHEN "SQT" :temp%=&0100:temp2%=1
3290 WHEN "LOG" :temp%=&0101:temp2%=1
```

▶▶▶

```
3300 WHEN "LGN" :temp%=%0110:temp2%=1
3310 WHEN "EXP" :temp%=%0111:temp2%=1
3320 WHEN "SIN" :temp%=%1000:temp2%=1
3330 WHEN "COS" :temp%=%1001:temp2%=1
3340 WHEN "TAN" :temp%=%1010:temp2%=1
3350 WHEN "ASN" :temp%=%1011:temp2%=1
3360 WHEN "ACS" :temp%=%1100:temp2%=1
3370 WHEN "ATN" :temp%=%1101:temp2%=1
3380 OTHERWISE ERROR "Unknown opcode"
3390 ENDCASE
3400 word%=word% OR (temp% << 20)
     OR (temp2% <<15)
3410 REM Bit 19 is e and bit 7 is f
3420 CASE prec$ OF
3430 WHEN "S" :temp%=(0<<19)+(0<<7)
3440 WHEN "D" :temp%=(0<<19)+(1<<7)
3450 WHEN "E" :temp%=(1<<19)+(0<<7)
3460 WHEN "P" :temp%=(1<<19)+(1<<7)
3470 OTHERWISE ERROR "Bad precision"
3480 ENDCASE
3490 word%=word% OR temp%
3500 REM Bits 18,17,16 are Fn
3510 temp%=EVAL(Fn$) << 16
3520 word%=word% OR temp%
3530 REM Bits 14,13,12 are Fd
3540 temp%=EVAL(Fd$) << 12
3550 word%=word% OR temp%
3560 REM Bits 11,10,9,8 are 0001
3570 word%=word% OR (%0001 << 8)
3580 REM Bits 6,5 are gh (rounding mode)
3590 CASE round$ OF
3600 WHEN "" :temp%=%00
3610 WHEN "P":temp%=%01
3620 WHEN "M":temp%=%10
3630 WHEN "Z":temp%=%11
3640 OTHERWISE ERROR "Bad rounding mode"
3650 ENDCASE
3660 word%=word% OR (temp% << 5)
3670 REM Bit 4 is 0
3680 word%=word% OR (0<<4)
3690 REM Bit 3 is i (Reg/value)
3700 IF imm$="#" temp%=1 ELSEtemp%=0
3710 word%=word% OR (temp%<<3)
3720 REM Bits 2,1,0 are Fm
3730 temp%=EVAL(Fm$) << 0
3740 word%=word% OR temp%
3750 [OPTopt%
3760  EQUD word%
3770 ]
3780 =""
4000 DEFFNcopcp(opc$,cc$,prec$,
     round$,Fm$,imm$,Fn$)
4010 LOCALword%,temp%
4020 REM CC is bits 31,30,29,28
4030 IFcc$="" cc$="AL"
4040 temp%=INSTR("EQ,NE,CS,CC,MI,
     PL,VS,VC,HI,LS,GE,LT,GT,LE,
     AL,NV",cc$)-1
4050 IF temp%<0 ERROR"Bad condition code"
4060 word%=word% OR ((temp% DIV 3)<<28)
4070 REM Bits 27,26,25,24 are 1110
4080 word%=word% OR (%1110 << 24)
4090 REM Bit 23,22,21 are opcode
4100 CASE opc$ OF
4110 WHEN "CMF"  :temp%=%100
4120 WHEN "CNF"  :temp%=%101
4130 WHEN "CMFE" :temp%=%110
4140 WHEN "CNFE" :temp%=%111
4150 OTHERWISE ERROR "Unknown opcode"
4160 ENDCASE
4170 word%=word% OR (temp% << 21)
4180 REM Bit 20 is 1
4190 word%=word% OR (1<<20)
4200 REM Bit 19 is e and bit 7 is f
4210 CASE prec$ OF
4220 WHEN "S" :temp%=(0<<19)+(0<<7)
4230 WHEN "D" :temp%=(0<<19)+(1<<7)
4240 WHEN "E" :temp%=(1<<19)+(0<<7)
4250 WHEN "P" :temp%=(1<<19)+(1<<7)
4260 OTHERWISE ERROR "Bad precision"
4270 ENDCASE
4280 word%=word% OR temp%
4290 REM Bits 18,17,16 are Fn
4300 temp%=EVAL(Fn$) << 16
4310 word%=word% OR temp%
4320 REM Bits 15,14,13,12 are 1111
4330 temp%=%1111 << 12
4340 word%=word% OR temp%
4350 REM Bits 11,10,9,8 are 0001
4360 word%=word% OR (%0001 << 8)
4370 REM Bits 6,5 are gh (rounding mode)
4380 CASE round$ OF
4390 WHEN "" :temp%=%00
4400 WHEN "P":temp%=%01
4410 WHEN "M":temp%=%10
4420 WHEN "Z":temp%=%11
4430 OTHERWISE ERROR "Bad rounding mode"
4440 ENDCASE
4450 word%=word% OR (temp% << 5)
4460 REM Bit 4 is 1
4470 word%=word% OR (1<<4)
4480 REM Bit 3 is i (Reg/value)
4490 IF imm$="#" temp%=1 ELSEtemp%=0
4500 word%=word% OR (temp%<<3)
4510 REM Bits 2,1,0 are Fm
4520 temp%=EVAL(Fm$) << 0
4530 word%=word% OR temp%
4540 [OPTopt%
4550  EQUD word%
4560 ]
4570 =""
```

```
Program 7 - Ellipse drawing example

 10 DIM code% 1000
 20 R0 = 0
 30 R1 = 1
 40 R2 = 2
 50 R3 = 3
 60 R4 = 4
 70 R5 = 5
 80 R6 = 6
 90 R7 = 7
100 R8 = 8
110 R9 = 9
120 R10 = 10
130 R11 = 11
140 R12 = 12
150 R13 = 13
160 R14 = 14
170 R15 = 15 : PC = R15
180 F0 = 0
190 F1 = 1
200 F2 = 2
210 F3 = 3
220 F4 = 4
230 F5 = 5
240 F6 = 6
250 F7 = 7
260 FOR pass% = 0 TO 3 STEP 3
270 P% = code%
280 [ OPT pass%
290 .const
300 EQUD &42652EE1
    \\ FP constant giving degrees in 1 radian
310 \\ ELLIPSE
320 \\R0 = plot code (absolute)
330 \\R1 = x
340 \\R2 = y
350 \\R3 = semi-major
360 \\R4 = semi-minor
370 \\R5 = angle to rotate by (degrees)
380 \\Uses R5 = maxy
390 \\      R6 = shearx
400 \\      R7 = silcew
410 \\      F1 = cos angle
420 \\      F2 = sin angle
430 \\      F3, F4, F5, F6 as temporaries
440 .ellipserot
450 STMFD R13!,{R0-R9,R14}

460 FNcoprt
    ("FLT","","S","","F0","R5","","F0")
470 ADR R5,const
480 FNcopdt
    ("LDF","","S","F1","R5","0","PRE","")
490 FNcopdo
    ("DVF","","S","","F0","F0","","F1")
500 FNcopdo
    ("COS","","S","","F0","F1","","F0")
510 FNcopdo
    ("SIN","","S","","F0","F2","","F0")
520 FNcoprt
    ("FLT","","S","","F4","R4","","F4")
530 FNcopdo
    ("MUF","","S","","F4","F3","","F1")
    \\ min*cos
540 FNcoprt
    ("FLT","","S","","F6","R3","","F6")

550 FNcopdo
    ("MUF","","S","","F2","F5","","F6")
    \\ maj*sin

560 FNcopdo(
    "MUF","","S","","F3","F3","","F3")
    \\ (min*cos)^2

570 FNcopdo
    ("MUF","","S","","F5","F5","","F5")
    \\ (maj*sin)^2

580 FNcopdo
    ("ADF","","S","","F3","F5","","F5")
590 FNcopdo
    ("SQT","","S","","F5","F5","","F5")
600 FNcoprt
    ("FIX","","S","","F5","R5","","F5")
    \\ maxy
610 MUL R8,R3,R3
620 MUL R9,R4,R4
630 SUB R6,R8,R9
640 FNcoprt("FLT","","S","","F6","R6","","F6")
650 FNcopdo("MUF","","S","","F1","F3","","F2")
660 FNcopdo("MUF","","S","","F3","F3","","F6")
670 FNcopdo("DVF","","S","","F3","F3","","F5")
760 SWI "OS_Plot"
770 LDMFD R13!,{R0,R1}
780 ADD R1,R1,R6

790 ADD R2,R2,R5
800 SWI "OS_Plot"
810 LDMFD R13!,{R2-R9,PC}
820 ]
830 NEXT
840 A% = &C5 : REM ellipse outline
850 B% = 640 : REM centre x
860 C% = 512 : REM centre y
870 REPEAT
880 D% = RND(400) : REM semi-major
890 E% = RND(400) : REM semi-minor
900 F% = RND(360) : REM angle
910 CALLellipserot
920 UNTIL FALSE
930 END
```

point number and places it in a floaing point register. FIX does the inverse of this, it places the integer part of a floating point number into an ARM register.

Using the floating point instructions

Anyone who has already rushed to their Archimedes to try to write an assembly language program which uses the floating point instructions will have had a nasty shock. The BASIC assembler does not understand them. What you have to do, somehow, is to generate the binary pattern for the machine code instruction directly and place this correctly in the object code being produced by the assembler.

Rolling your own instructions

The binary pattern for each instruction is made up of 32 bits. These are split up into several fields, each representing part of the instruction. For example, 2 bits are used to give the rounding mode, another 2 bits for the precision, 4 bits for the condition code etc. Table 5 explains the format for each class of floating point instructions.

One way to use the floating point system is therefore to sit down with the tables and work out the bit pattern for your instructions one-at-a-time and then used EQUD to incorporate them in your assembler program. For example:

```
[ MOV R0,#3700 EQUD &EE000110
\\ FLTS R0,F0 .... ]
```

This is fine if you like bit-twiddling in your head and have plenty of time to waste. A much better method is to use a macro.

What is a Macro?

This is essentially a user defined *instruction* in the assembly language text.

A simple example is probably the best way of explaining it:

```
[ LDR R0,[R12,#20]
FNabsvalue(R0)
..... ] END
DEFFNabsvalue(reg) [ TEQ reg, #0
RSB reg,reg,#0
and negate if required ] =""
```

Listing 6 provides four macros which generate the bit pattern for any of the floating point instructions and place it in the assembler program using EQUD. FNcopdo deals with arithmetic instructions, FNcopcp with comparisons, FNcopdt with load/stores and FNcoprt with conversions.

Program 7 lists an example program showing the macros in action. It is derived from the action of the ELLIPSE keyword in BASIC. This keyword allows an ellipse to be specified in terms of the lengths of its axes and the angle through which it has been rotated from the horizontal (figure 8a).

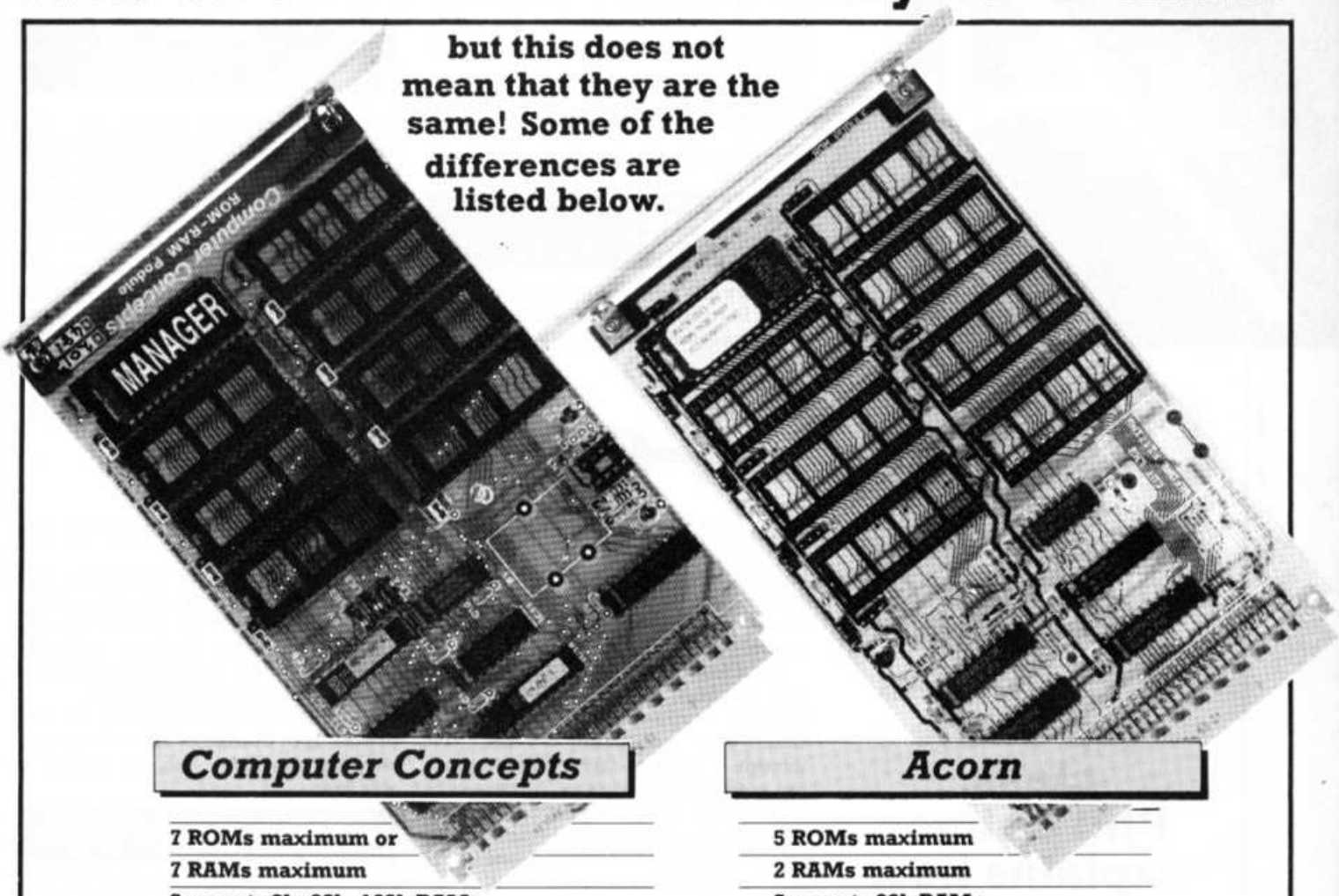
In order to draw the ellipse, BASIC has to convert these parameters into the form required by the operating system (figure 8b). The first point to specify is the centre. The second is a point at the same height as the centre on the edge of the ellipse. The last is the highest point of the ellipse. BASIC then hands the points to the operating system using three SWI *OS—Plot* calls, the first two performing move's, the third drawing the ellipse.

When typing it in you need to add the macros onto the end of the program. Then before running it, make sure the floating point module is active by placing your welcome disc in drive 0 and typing:

```
*RMLOAD :0.$.MODULES. FPEMULATOR
```

The two ROM boards may look alike

but this does not mean that they are the same! Some of the differences are listed below.



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The potential for Archimedes software without a ROM podule is severely limited. There will be many ROM based programs in future, in addition to INTER-WORD, SHEET, CHART and SPELL-MASTER, which are already available. Remember, ROM based programs on the Archimedes still have many of the same advantages over disc based programs that they had on the BBC; programs load faster, they are more reliable, they are permanently available and, most important, such programs can use overlay techniques to save a large proportion of the available memory. Consider running a document processor, spelling checker, drawing program and perhaps a thesaurus; the total program size could easily be over 600K—totally impractical, even on a 1 Meg machine.

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Colour Co-ordinated

Phil Colmer

256 colours in high resolution puts the Archimedes top of the class. Phil Colmer explains how it's done and how you can use all those hues and shades

The graphic displays of the Archimedes are produced by the Acorn custom chip VIDC. This chip produces linear RGB signals and is thus, in theory, capable of producing an infinite range of colours. In practice, however, the number of possible colours is determined by the smallest possible change in voltage in the red, green and blue signals. This is in turn determined in VIDC by the number of bits used to hold the colour intensity – namely four bits per gun or twelve bits in total, giving 2 ^ 12 or 4096 possible colours.

VIDC has 16 palette registers. In other words, if you are in a Mode which can display 16 or less colours, then if you plot a shape in logical colour 1, VIDC displays the colour stored in palette register 1.

Unfortunately, because there are only 16 palette registers, the one-to-one relationship of logical colour to register explained above cannot be continued with 256 colour Modes – there simply aren't the registers. So, in 256 colour Modes, for each logical colour, the top four bits go straight to the red, green and blue guns, while the bottom four bits specify which palette register is used to make up the remaining bits.

Good relations

The relationship for the top four bits is as follows:

```
3 bit 7 goes to blue bit 3
bit 6 goes to green bit 3
bit 5 goes to green bit 2
bit 4 goes to red bit 1
```

There are two points to make here. First, it should be apparent by now that you cannot actually redefine the colours in 256 colour Modes since you cannot affect the top four bits. All that you can do is redefine the bottom four bits, or the shading of the colours. Second, since two of the top four bits go to the green gun, you have more control over the red and blue guns.

So, if four of the twelve bits going to the guns are fixed, how can 4096 colours be achieved? Program one (Col256) demonstrates how the colours can be cycled through. It works by taking the appropriate red, green and blue levels and deciding which logical colour should be used (on the basis that the most important bits of the displayed colour are determined by the logical colour used) and then reprogramming one of the palette registers to make up the remaining bits.

Probably the most important point to note here is that there is a lot of bit shifting involved. This ensures compatibility with any future version of VIDC.

Misleading BASIC

Well, that is all very well, but what is the actual relationship between the colours and the palette registers? The point is that BASIC implies through GCOL and TINT that there are 64 colours with 4 shades. However, since there are only 16 palette registers, you can only really have 16 colours with 16 shades. The colours are fixed and you can manipulate the shades. This is probably best demonstrated by program 2 (Pal256). This program starts by reading the default palette for Mode 15 and determining the red, green and blue settings for each register. A series of squares is then drawn in a 16 by 16 matrix. A row of squares represents a palette register while a column of squares represents one of the 16 base colours.

The matrix is an attempt to demonstrate the "16 colours with 16 shades" relationship. Since BASIC enforces the "64 colours with 4 shades" relationship, the appropriate logical colour and tint has to be calculated.

Once the matrix has been drawn, you can move the pointer around and select a palette register by pressing the left hand mouse button. You can then adjust the RGB levels of the register by using the keypad thus:

Decrease	Colour	Increase
7	Red	9
4	Green	6
1	Blue	3

When you have finished, press 0 to return to using the pointer. The other operation which you can perform is copying the RGB values from one register to another. To do this, place the pointer over the row of the source register and press the middle button. Then move the pointer to the row of the destination register and press the left hand button to perform the copy of any other mouse button to cancel the copy.

To leave the program, press the right hand mouse button.

It is certainly possible to achieve some stunning results from the 256 colour Modes as can be seen from the digitised pictures displayed by Acorn at the shows. Hopefully, the above will help you understand how the system works just that little bit more.

NOTE The programs listed in this article are available on Archimedes support disc, DA4. See the advert in this issue.

♦LISTING 1♦

```
   10REM > Col256
   20REM
   30REM Written by Philip J C
olmer, (C)A&B COMPUTING
   40REM
   50MODE 15:OFF
   60FORred%=0TO15
   70 FORgreen%=0TO15
   80  FORblue%=0TO15
   90   PRINTTAB(0,0);"Red = "
,red%;TAB(40);FNbin(red%)
  100   PRINTTAB(0,1);"Green =
 ",green%;TAB(40);FNbin(green%
)
  110   PRINTTAB(0,2);"Blue =
",blue%;TAB(40);FNbin(blue%)
  120   blue_b3%=(blue% AND %1
000)>>2
  130   green_b23%=(green% AND
 %1100)>>2
  140   red_b3%=(red% AND %100
0)>>2
  150   col%=(blue_b3% <<4)
  160   col%+=(green_b23% <<2)
  170   col%+=red_b3%
  180   PRINTTAB(0,3);"GCOL =
",col%;TAB(40);FNbin(col%)
  190   VDU19,1,16,red%<<4,gre
en%<<4,blue%<<4
  200   GCOL 0,col% TINT 1<<6
  210   RECTANGLE FILL 0,0,500
,500
  220  NEXT
  230 NEXT
  240NEXT
  250END
  260:
  270DEFFNbin(b%)
  280LOCAL s$,c%,i%
  290s$=""
  300FORi%=0TO15
  310 c%=b% AND 1
  320 IF c% s$="1"+s$ ELSE s$=
"0"+s$
  330 b%=b%>>>1
  340NEXT
  350=s$
```

◆LISTING 2◆

```
   10REM > Pal256
   20REM
   30REM Written by Philip J C
olmer,(C)A&B COMPUTING
   40REM
   50PROCinitialise
   60*POINTER
   70REPEAT
   80 REPEAT
   90  MOUSE X%,Y%,Z%
  100  r%=Y%/60
  110 UNTILZ%<>0
  120 CASE Z% OF
  130  WHEN2: PROCcopy_palette
(r%)
  140  WHEN4: PROCedit_palette
(r%)
  150 ENDCASE
  160UNTILZ%=1
  170MODE15
  180END
  190:
  200DEFPROCcopy_palette(r%)
  210LOCAL X%,Y%,Z%,r1%
  220PRINTTAB(0,0);"Source sel
ected - now choose destination
 or cancel"
  230VDU5
  240GCOL15 TINT0:MOVE16*60,r%
*60+35:PRINT"<="
  250PROCwait
  260REPEAT
  270 MOUSE X%,Y%,Z%
  280 r1%=Y%/60
  290UNTILZ%<>0
  300IFZ%=4 THEN
  310 p%(r1%,0)=p%(r%,0)
  320 p%(r1%,1)=p%(r%,1)
  330 p%(r1%,2)=p%(r%,2)
  340 PROCpalette(r1%)
  350ENDIF
  360PROCwait:VDU4:OFF
  370PRINTTAB(0,0);SPC(80)
  380GCOL0 TINT0:RECTANGLE FIL
L 16*60,r%*60,60,60
  390ENDPROC
  400:
  410DEFPROCedit_palette(r%)
  420LOCAL A%
  430IFr%>15 ENDPROC
  440PRINTTAB(0,0);"Use keypad
 to adjust RGB; 0 to exit"
  450VDU5
  460GCOL15 TINT0:MOVE16*60,r%
*60+35:PRINT"<="
  470REPEAT
  480 MOVE17*60,r%*60+35:PRINT
"R=";p%(r%,0);":G=";p%(r%,1);"
:B=";p%(r%,2)
  490 A%=GET
  500 IFA%=ASC"7" p%(r%,0)-=1:
IFp%(r%,0)<0 p%(r%,0)=0
  510 IFA%=ASC"4" p%(r%,1)-=1:
IFp%(r%,1)<0 p%(r%,1)=0
  520 IFA%=ASC"1" p%(r%,2)-=1:
IFp%(r%,2)<0 p%(r%,2)=0
  530 IFA%=ASC"9" p%(r%,0)+=1:
IFp%(r%,0)>7 p%(r%,0)=7
  540 IFA%=ASC"6" p%(r%,1)+=1:
IFp%(r%,1)>3 p%(r%,1)=3
  550 IFA%=ASC"3" p%(r%,2)+=1:
IFp%(r%,2)>7 p%(r%,2)=7
  560 PROCpalette(r%)
  570 GCOL0 TINT0:RECTANGLE FI
LL 17*60,r%*60,2000,60:GCOL15
TINT0
  580UNTILA%=48:VDU4:OFF
  590PRINTTAB(0,0);SPC(80)
  600GCOL0 TINT0:RECTANGLE FIL
L 16*60,r%*60,60,60
  610ENDPROC
  620:
  630DEFPROCpalette(r%)
  640VDU19,r%,16,p%(r%,0)<<4,p
%(r%,1)<<4,p%(r%,2)<<4
  650ENDPROC
  660:
  670DEFPROCwait
  680LOCAL X%,Y%,Z%
  690REPEAT
  700 MOUSE X%,Y%,Z%
  710UNTILZ%=0
  720ENDPROC
  730:
  740DEFPROCinitialise
  750LOCAL r%,v%,x%,y%
  760MODE 15:OFF
  770DIM p%(15,2),p_original%(
15,2),menu% 100,block% 100
  780FORr%=0TO15
  790 SYS"OS_ReadPalette",r%,1
6 TO ,,v%
  800 p%(r%,0)=((v% AND &FF00)
>>8)>>4
  810 p%(r%,1)=((v% AND &FF000
0)>>16)>>4
  820 p%(r%,2)=((v% AND &FF000
000)>>24)>>4
  830NEXT
  840p_original%()=p%()
  850FORx%=0TO15
  860 FORy%=0TO15
  870  PROCdraw_rectangle(x%,y
%)
  880 NEXT
  890NEXT
  900ENDPROC
  910:
  920DEFPROCdraw_rectangle(x%,
y%)
  930LOCAL b3%,g32%,r3%,b2%,r2
%,t%,col%
  940b3%=(x% AND %1000)>>3
  950g32%=(x% AND %110)>>1
  960r3%=(x% AND 1)
  970b2%=(y% AND %1000)>>3
  980r2%=(y% AND %100)>>2
  990t%=(y% AND %11)
 1000col%=(b3%<<5)+(b2%<<4)+(g
32%<<2)+(r3%<<1)+(r2%)
 1010GCOL col% TINT t%<<6
 1020RECTANGLE FILL x%*60,y%*6
0,40,40
 1030ENDPROC
```


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Supplier: Database Software
Mini Office 2 – bargain basement, great value
Supplier: Computer Concepts
Mega 3 – Word, Sheet and Chart in one
Supplier: Acornsoft
Overview – swap View family data in memory

Spreadsheets

Supplier: **Acornsoft**
Viewsheet – standard on Master 128, has stood the test of time
Supplier: Computer Concepts
Intersheet – excellent, easy export to Interchart

Database

Supplier: **Acornsoft**
Viewstore – powerful but difficult to learn. Disc system dependent
Supplier: Minerva
System Delta Card Index – straightforward but benefits from support software in the System Delta series
Supplier: Clares
Betabase/Utilities – disc based
Supplier: Beebug
Masterfile 2 – disc based workhorse
Supplier: Computer Concepts
Interbase – programmable and powerful but lacking proper card index front end. Look for relaunch.

Wordprocessors

Supplier: **Acornsoft**
View – standard with Master Series, WYSIWYG with good support software
Viewspell
Viewindex
Supplier: Computer Concepts
Wordwise+ – 40 column, 80 preview, uniquely programmable, lots of 3rd party utilities
Interword – WYSIWYG and pop down menus
Spellmaster – fastest spell checker with ROM based dictionary

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MASTER SERIES
MICROCOMPUTER
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Accounts

Supplier: **Minerva**
System Delta
Personal Accountant modules
Supplier: Meadow Computers
Micro-Trader
Micro-Stock
Micro-Mailer
Payroll
Supplier: Apricote Studios
Account Book

Graphs/Charts

Supplier: **Minerva**
Gammaplot – can be used with System Delta or stand alone
Supplier: Acornsoft
Viewplot – disappointing
Supplier: Computer Concepts
Interchart

FACTFILE

Acornsoft ☎ 0933 228953
Apricote Studios ☎ 0354 78432
Clares ☎ 0606 48511
Computer Concepts ☎ 0442 63933
Contex ☎ 023 03 347
Iver Computers ☎ 0753 651990
Meadow ☎ 025 682 2008
Mewsoft ☎ 01 267 2642
Minerva ☎ 0392 37756
PMS ☎ 03552 32796
RBRC ☎ 01 946 8641
Squirrel ☎ 061 789 4120

Productivity Software

Supplier: **PMS**
Genie – practical popup utilities
Genie Junior – disc based data but cheaper
Genie Utilities
Supplier: Mewsoft
FaxFile – filofax printer for yuppies

MSDOS

Supplier: **Acorn**
Master 512/GEM Word and Paint
Runs MSDOS business packages both commercial and shareware eg Ability from Migent, Tax Advisor from System Applied Technology, Flying Start from Mitre
Universal co-pro/512 equivalent for Model B

Home Finance

Supplier: **Squirrelsoft**
Cash, Investment and Building Society Care
Supplier: Contex Computing
Bank Manager

Applications

Supplier: **Minerva**
System Delta
Video Rental
School Admin
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Newsagent
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WILLIAM BENJAMIN

TAKING CONTROL

Interfacing Acorn micros made simple

Control In the Primary Classroom

Now the computer is well established in the classroom by applying control technology, children have the power at their disposal to control their models with the micro. Essentially "control" involves children creating a set of instructions thus providing teachers with a unique opportunity to examine (and influence), their thinking processes. Some common characteristics of taking computer control into the classroom are as follows:

1. Independence is fostered in children.
2. Group work is central to control projects and should be encouraged
3. Boys and girls equally are expected to take part in all activities.
4. A problem solving approach is adopted in which individual curriculum areas are integrated
5. The computer is treated as a tool
6. Teachers are willing to learn alongside the children.

Essentially, computer control presents an opportunity to unite and develop a wide range of skills and experiences acquired across the curriculum. Not only does it promote learning but also allows the weakest children opportunities for success alongside the most able. One key element in adopting a problem solving approach to teaching control technology is the teacher's inclination and ability. It is vital that the teacher is whole-hearted and confident in his/her approach to the subject. It appears seemingly impossible for a non-science trained teacher to know enough to be able to guide children logically in how to set about finding some simple answers practically. Help is at hand! To help you begin control techniques and projects, this month I concentrate on a beginner's project concerned with demonstrating the BBC Micro's User port – that socket under the Beeb into which you have plugged Concept Keyboards etc and never given it further thought. It is via the User port that a good deal of of the Beeb's control potential can be harnessed and realised.

The project is based on the excellent work **Sensing and control projects for the BBC** by Thomas Nunns (Microbooks). In addition, I shall examine the types of control equipment that are available ready-made for the teacher who is frightened off by the thought of soldering and building electronic circuits. The two approaches are not necessarily mutually exclusive and I would recommend that anyone interested by the idea of computer control should read the whole article and then tackle what they dare!

What use is Computer Control?

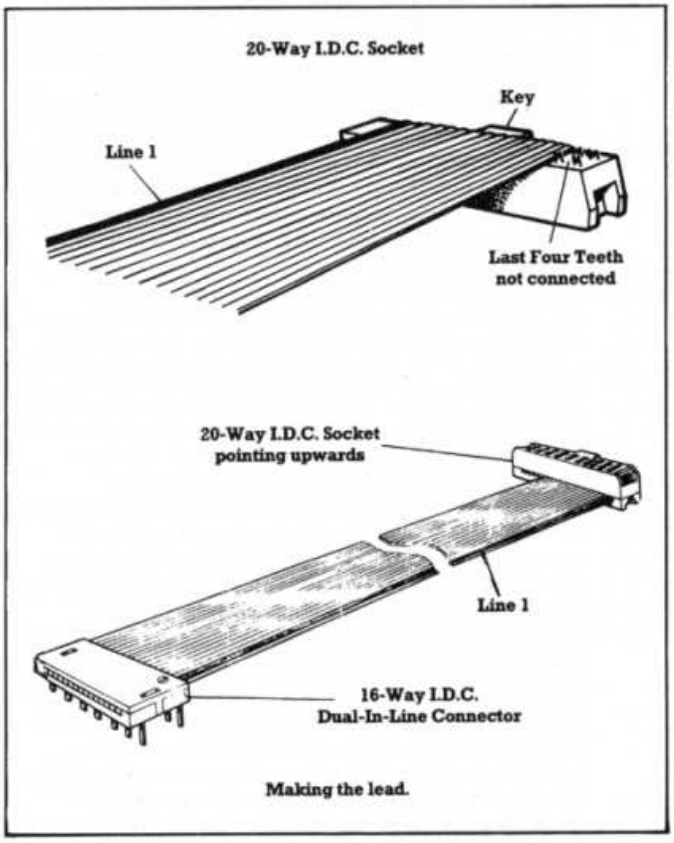
It is standard practice for computer educationalists to come up with wonderful ideas for the computer in the classroom, only for the ordinary classroom teacher to say, "Yes, but why should I want to do that? Where does it fit into my curriculum? How can I justify it when the adviser comes in?" All these are valid questions. It is too easy to be captivated by a buggy running around the classroom floor or a robot arm waggling away in the corner. If however you have no good reason for doing it then or it is not part of a scheme of work then you will be unable to follow up the work properly or exploit what has been achieved in further developmental work. So, for a few moments, let's cast idealism and enthusiasm aside and look at some good reasons for adopting control technology. These remarks are not just confined to the primary or secondary phases but are general.

It's fun!

The first thing to note is that computer control is fun. Children enjoy it and have great fun building models in Lego or Fischer-Technic and then driving them from the computer. Although fun is not an academic measure it is certain that it is a great motivating factor. For that reason it should be exploited if we can then lead children into discovering skills, concepts and experiences which will be of use to them in other areas.

It's all around

The second factor is that computer control is all around us. Many everyday devices rely on computer control. If your computer has a printer you have an excellent example of a computer-controlled device there. Washing machines, VCRs, traffic lights and industrial robots spring to mind instantly. There are many more.



Making the lead.

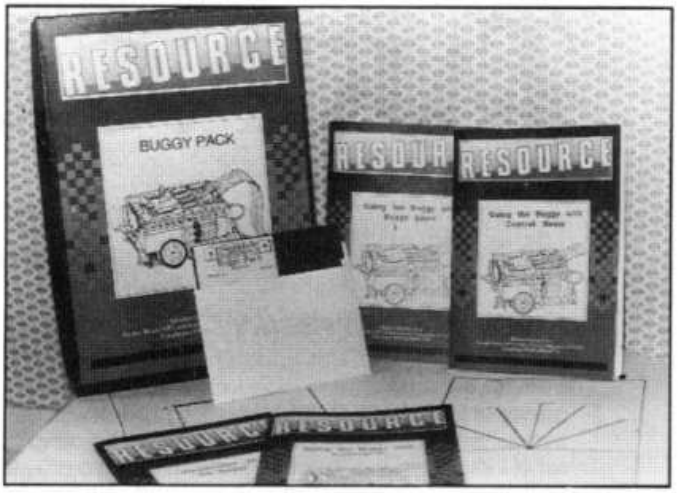
"My children will never make a set of traffic lights!" says the unconvinced reader. Perfectly true of course. I think any argument that bases itself solely on the idea of examples in the world would be foolish. However, the knowledge that those devices exist and operate in much the same way as the ones we are to examine is a good model on which to work for practical examples. In fact, the traffic light system used to be a standard part of every Computer Studies syllabus. It can indeed be emulated by the project below.

It's here

"OK," says our teacher reader, *"but that still has not told me why my children need to make a set of traffic lights"*. That type of project really has two main stages – the physical construction of the system and the control of it using some sort of computer language. The first part has no relationship to computer use at all except for consideration of the way in which the computer might be linked to the device. That being the case the child will be focussing on straightforward constructional and design skills in order to create something which will be appropriate to the task. That is a whole area that is not in the brief of this article but should be borne in mind since that is in fact a major part of the project work that a child will undertake.

If the teacher has said that the group has a specific construction kit, a computer and interface and that the problem to be solved is a method of getting a device to move around obstacles and keep a record of its progress then the first part is to construct an appropriate vehicle which will be able to sense its environment and move around it. The second part is then to provide it with the "intelligence" to undertake the task. Here the group have to take into account all the variables which will be faced by the device as it progresses. They have to not only provide the device with an appropriate reaction to every situation, but also have to link those reactions into a structure which will allow the solution of the initial problem. Now to drop that type of problem onto a group, unprepared would be unwise to say the least. Firstly, they would be unlikely to have the necessary programming skills and secondly, they would be unfamilair with the constraints of the problem. Development towards that situation has to be gradual and good packages will give you a structure in which your pupils may grow towards quite improbable skills. As an example, my eight-year old has been playing with a Lego Buggy kit during the writing of this article.

Using the interface and software created by RESOURCE he has been experimenting with moving the buggy specific distances and turning it through a right angle. One of the little competitions between him and me turned on how far the buggy would travel in 12 seconds. This provided an environment in which he first of all discovered a relationship between time and distance and was then able to estimate other distances from times I suggested. We then moved onto turning a right angle. The buggy would not turn the exact distance in a whole second so we had then to build up the concept of parts of a second on the other side of the decimal point. Given the comparison between that and the figures to the right of the point in decimal currency he soon grasped the fact that the second number from the point was a lot smaller than that next to it. If that were to be used as the basis for starting serious study of decimals and linked to currency there would be few children having problems with the concept. What is needed however, is a structure in which that study can take place. It cannot



be random and ad hoc. Work cards, group discussions and gentle prompting at appropriate times from the teacher can all help the process along.

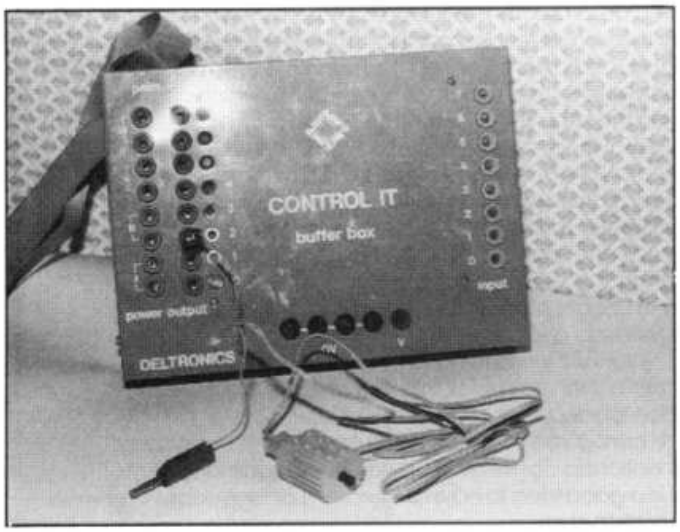
The Curricular Interface

The information our teacher wants is the justification to the head or to the adviser. Taking the points set out at the beginning of this article, it is possible to expand in relation to your own syllabus of studies by looking at the following points:

1. Maths concepts and control technology go hand in hand: – binary and denary maths (hex as well if you want!) – geometry – estimation – number skills
2. Constructional and design skills – evaluation of problem – postulation of possible solutions – refining of hypotheses in the light of practical work – manipulative skills – program design
3. Language – communication of concepts and discussion of problems (see below in group work) – planning of project – documentation
4. De mystification; close contact with computers, and an awareness of electronic systems – awareness of how systems make life easier – links with industry and the real world
5. Science – design and creation of simple circuits – inter-relation of electronic devices – sensing and monitoring via sensors
6. Group Work – problem solving – discussion – collaborative projects It may be that the more enterprising and adventurous teacher will be able significantly to increase that list. For example, under the monitoring and sensing section in science there is a very wide scope for biological monitoring, taking into account such things as scanning vital signs using heart-beat sensors, moisture detectors, temperature sensors and so on. This could for example be undertaken by linking the computer into a sensor mounted on an exercise cycle. This would detect a white patch on the wheel which would monitor the speed of rotation by counting the frequency with which it passed the sensor. If this is monitored as a continuous graph this can then be set against readings taken from the biological status sensors.

Before we return to more simple matters and an examination of some of the available equipment and software, – A Warning! It is most important that you manage carefully the rotation of responsibility for work amongst the sexes. Recent research has shown that girls who are placed in a situation where computers

▶▶



are to be used will defer to boys because they see it as "boys's work".

The only way to break this mould is to create a situation where the children are given equal opportunity to be both chiefs and indians! Unfortunately the trait is not helped by factors in teachers which will come out despite the best of intentions – like the fact that many women will not read this far because it is about control – association with electronics – therefore the man's work. It's an horrendous cycle which can only be broken by positive discrimination.

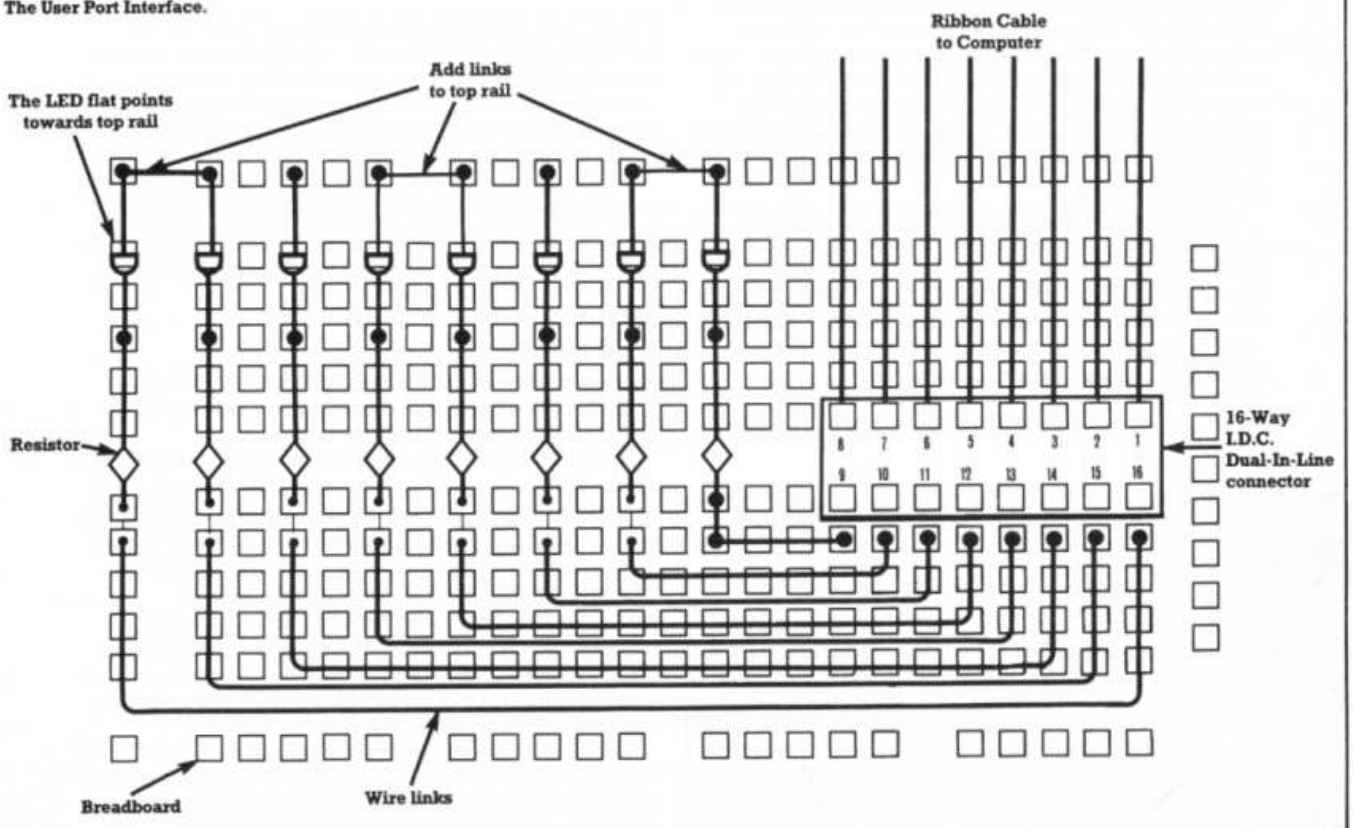
Hardware and Software

There is a good deal of material available for control in the classroom environment. Some of it is very expensive and sophisticated, others cheap and cheerful. The next few paragraphs will concentrate on some of the cheaper and simpler devices with a view to "getting started". It is certain that once you do het started you will find plenty of additional materials – some of which you may wish to design and make yourself. The easiest way to get started is with a computer-controlled vehicle of some sort. The Lego Buggy is an excellent choice for a number of reasons. Firstly – it does not always have to be a Buggy. Technical Lego is a medium which can be turned to so many activities. In conjunction with the neat interface from RESOURCE and the three levels of software provided the Lego Buggy becomes a reasonably accurate "turtle" for LOGO work. It is also a package which comes complete with teacher's notes, worksheets and in-built growth potential.

Logotron and RESOURCE jointly market a robot arm with a computer interface and software. This pack allows a taster of what a robot arm can do. The arm itself is made of plastic but it is quite robust. The interface connects to the user port of the BBC and the whole thing is powered by four "D" size batteries. The arm has a shovel, "fingers and a magnet attachment. Its accuracy is a little variable but is quite suitable for simple tasks. If you want to be a little more adventurous then it is perfectly possible to control a model for example using what is called a buffer box. This is a device which goes between the computer and the model and provides a "buffer" against damage to the computer from the malfunction of the model. This device is essential for any but the simplest lower-power projects. An excellent box to use is the Deltronics Control-IT box.

This provides a possibility for eight input and eight output lines, controlled via the User and Printer ports. Output lines all have an LED which shows their state (lit

The User Port Interface.


Ribbon Cable to Computer
Add links to top rail
The LED flat points towards top rail
Resistor
16-Way I.D.C. Dual-In-Line connector
8 7 6 5 4 3 2 1
9 10 11 12 13 14 15 16
Breadboard
Wire links

```
>L.
  10 REM LISTING 1
  20 REM SWITCH LINE 1 ON AND OFF
  30 ?&FE62=255: REM ALL LINES TO OUTPUT
  40 ?&FE60=0:REM SWITCH ALL LINES OFF
  50 REPEAT
  60  FOR I=1 TO 200:NEXT
  70  I$=INKEY$(5)
  80  IF I$="1" ?&FE60=1
  90  IF I$="0" ?&FE60=0
 100 *FX15,1
 110 UNTIL FALSE
```

when the line is "high") and therefore the box may be used on its own for initial understanding of the principles of control. The box may be purchased with or without power supply. If you have the no power option then you will need to find a way of providing the correct level of power to the devices being used. It may be possible to link your model to the disc drive power supply on the underside of the BBC but it is advisable only to do that after taking advice about the suitability of the device. A large, high power motor for example would probably burn out the power supply tracks on the computer's printed circuit board. The powered buffer box is a safer alternative.

The question then arises as to what should be interfaced through this buffer box. If you have a set of Lego with motors then it is a simple task to change the plugs on the cables to go into the buffer box. Motors of the correct rating may also be interfaced through the box, although you will need to be sure that you are able to mount them into the model to be controlled. Any electrical device may be driven in this way.

Languages will allow you to reverse the polarity of the power source so that motors will run in reverse. Don't forget light bulbs and LEDs which may also be interfaced. In terms of sensors, it is a simple matter to connect light and heat sensors or micro-switches which then provide a means of monitoring the outside environment. A buggy with micro-switch bumpers for instance is able to sense when it has bumped into something. With a certain amount of programming it is then possible to instruct it to do something about it when that happens.

Infra-red sensors are useful for sensing white or black lines, reading bar codes and tracing patters – following a line through obstacles is an interesting exercise. RESOURCE supply a Control Kit which consists of a Deltronics Buffer Box, two light detectors, two lights, two microswitches, an analogue light sensor and cassette port-operated torch as well as a variety of software.

There are the control languages which you might decide to use. These are the method by which you talk to the computer and get it to do what you want. Some languages seem bent on confusing the user, but simple languages such as Buggy BASIC which comes with the Lego Buggy Interface above stick as close to natural language as possible. Commands such as *Back, Right* and *Left* followed by a time parameter are easy to think of and to understand when editing a program. The problem is that the nearer to natural language that one gets, the less powerful the language seems to be. Logo is a useful intermediary and Logotron's Control Logo allows users very powerful facilities in a relatively simple format.

Users will need to have the normal Logotron Logo chip in their machines first of all and the Control Logo is then loaded in as an extension. The various ports may be configured for input and output and all the systems mentioned above may be driven using the language. It is a good idea to have a hierarchy of languages on which to draw.

The simple language is fine for starting off but soon become frustratingly limiting when one is trying more complex operations. It is for this reason that RESOURCE include a range of software in their packs, allowing progression and room for expansion. If you are still baffled by the possibilities of control but want to know, the simplest method is to contact your computer education adviser and ask him or her if there are any courses available in the subject. There is nothing to beat practical experience!

```
>
>L.
   10 REM LISTING 1B
   20 REM SWITCH LINE 1 ON AND OFF
   30 ?&FE62=255: REM ALL LINES TO OUTPUT
   40 ?&FE60=0:REM SWITCH ALL LINES OFF
   50 REPEAT
   60  ?&FE60=1:REM SWITCH LINE 1 ON
   70  FOR I=1 TO 200:NEXT
   80  ?&FE60=0:REM SWITCH LINE 1 OFF
   90  FOR I=1 TO 200:NEXT
  100 UNTIL FALSE
```

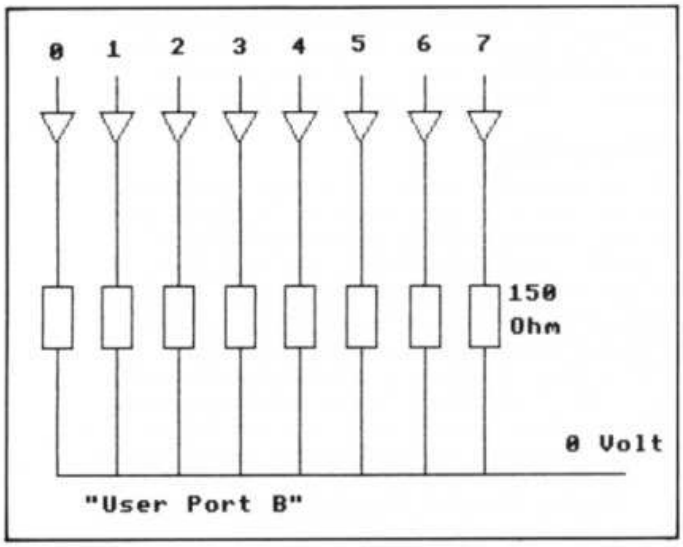
```
>
>L.
    2 REM LISTING 2
   10 ?&FE62=255 :REM  ALL LINES TO OUTPUT
   19 RESTORE 80
   20 FOR S= 1 TO 14
   30 READ A
   40 ?&FE60=A
   50 FOR Y=1 TO 100:NEXT Y
   60 NEXT S
   70 GOTO 19
   80 DATA 1,2,4,8,16,32,64,128,64,32,16,8,4,2,
```

And so to the other side of the coin – the practical project. Although some of the language in the next section may be unfamiliar it is not altogether necessary to be familar with the terminology. Understanding of that is likely to develop as the project grows.

The User Port

The User port is essentially a 20 pin connector, eight pins of which carry lines which are switchable by the computer, two are "handshake" lines which communicate between the computer and the outside device to make sure that they are working together at the same speed, and the rest are five volt power supply lines or are connected to earth. The User port pins are connected to a chip inside the computer called the 6522 versatile interface adaptor (VIA). Without becoming too technical, this chip contains eight registers which control each of the eight switchable lines and earth. The eight switchable lines can be used to send signals out to an external device connected to the User port or to receive signals from one.

When we talk of sending signals out, all that is meant is that the line (a piece of wire!) is either carrying an electric current, or it isn't. These two states are represented in the computer as 0 for no power and 1



for power. Another term you may come across for the same thing is that the line is "high" (carrying power) or low (no power). In this project we will be sending out signals from the computer to switch on and off eight light emitting diodes (LED), like those small lights on the front of the BBC B or Master 128. The objective is to be able to see how the eight control lines can be switched on and off via a simple program. The components needed are: 1 x 20 way IDC socket 1 x 16 way IDC dual-in-line connector plug 1 metre of 16 way ribbon cable 1 x section of "breadboard" (VERO board or similar) 8 x 150ohm resistors 8 x LEDs 1m of 0.6mm hard core equipment wire The above components can be purchased at stores like Maplins, Watford Electronics etc. The total cost should not exceed £8.00. The breadboard has numerous holes into which the electronic components can be plugged and removed as necessary. This avoids the necessity to solder components and allows their constant reuse and rearrangement.

Perhaps the most difficult part of this whole project is to make up the connecting cable and its 16 way DIL. plug and 20 way socket. Figure 1 shows the orientation of the cable and connectors. You will discover that each connector has two rows of teeth which must pierce the insulation on the ribbon cable to make contact with the wire inside. Carefully note the orientation of the cable : the red line always represents line one.

```
>
>L.
  10 REM LISTING 3
  20 REM COUNTING IN BINARY
  30 ?&FE62=255: REM ALL LINES TO OUTPUT
  40 ?&FE60=0:REM SWITCH ALL LINES OFF
  50 X=0
  60 count=0
  70 REPEAT
  80 ?&FE60=count
  90 count=(count+1) MOD 256
 100 FOR I=1 TO 1000:NEXT I
 110 UNTIL X=1
```

It is important that the ribbon cable is attached to the leftmost pins of the 20 way connector. There should be four unconnected teeth to the right. In addition you should check the correct orientation of the 16 way, DIL. header plug : the pins are numbered on the removable top. Make sure that pin 1 on the plug corresponds to the red line on the cable. Both the socket and the plug have tops which must be each squeezed onto the connector. This is best done in a vice. Be careful with the pins on the plug. It is necessary to use a small piece of wood between the two rows of pins in order to avoid crushing them. Figure 2 shows how DIL. connector plugs onto the breadboard. It is important that it spans the central area. All the pins of the DIL. plug above the cntral area of the breadboard are connected to the computer's earth via the ribbon cable. Join any one of these pins to the top rail of the breadboard by a short piece of equipment wire. Figure 3 and the accompanying circuit diagram each show the position of the wire links, resistors and LEDs.

An LED must have a resistor in series with it. Unlike resistors it is important that the LEDs are inserted into the circuit the correct way round. Orientation is achieved by the fact that each LED has a "flat" edge corresponding to one of the legs – the short one. This is the cathode and must be placed in the top rail of the breadboard.

The longer of the two legs occupies the same row as the resistor. The equipment wire must be cut to various lengths with wire cutters or a pair of old scissors and stripped of insulation at each end with a sharp knife or wire strippers if you possess them. Each section of wire links one end of a resistor to it corresponding data line from the User port/cable. Once this is achieved you are ready to type in the various listings.

```
>L.07
>L.
  10 REM LISTING 3B
  20 REM OUTPUT A NUMBER
  30 ?&FE62=255 :REM  ALL LINES TO OUTPUT
  40 ?&FE60=0:REM SWITCH OFF ALL LINES
  50 CLS
  60 INPUT "ENTER YOUR NUMBER....";A%
  70 PRINT A%
  80 ?&FE60=A%
  90 PRINT "PRESS A KEY TO CONTINUE..."
 100 G=GET
 110 GOTO30
```

Programming the Interface

We must tell the computer that we are going to use the lines from the User port as outputs rather than inputs – that we are sending messages to the breadboard circuit. To do this we must send the 6522 VIA chip the command: ?&FE62=255 "?" is a BASIC command which means *'put into the memory at address . . .'* &FE62 is an address in the memory which is called the Data Direction Register (DDR). When this address is given the value 255 it means that all the lines are sending signals out and none are set to receive signals.

Next we must give a value to the register in the 6522 VIA which switches the LED lines on and off. This register in the memory is &FE60. ?&FE60=1 switches the LED on, ?&FE60=0 switches it off again. If nothing occurs with the first LED then go back and check each step in the project very carefully to check no mistakes have been made and that all connections are good. Typing the two commands ?&FE60=1 and ?&FE60=0 continually is rather inefficient – the light could be controlled by a simple switch. **Listing 1** emulates the computer keys

```
>
>L.
   10  REM LISTING 3C
   20  REM COUNTING TO 255 IN BINARY
   30  ?&FE62=255: REM ALL LINES TO OUTPUT
   40  ?&FE60=0:REM SWITCH ALL LINES OFF
   50  X=0
   60  count=0
   70  REPEAT
   75    PRINTcount ;
   80    ?&FE60=count
   90    count=(count+1) MOD 256
  100    FOR I=1 TO 1000:NEXT
  110  UNTIL X=1
```

"0" and "1" to simulate a switch. Again only the LED corresponding to line 1 should be lit.

If any other LED is lit then check that the link wires are attached in the correct order. **Listing 1B** demonstrates how the LED may be switched on and off rapidly under computer control. **Listing 2** switches each LED on in sequence from 1 to 8 and vice versa. The important thing to note in this demonstration is that the value of each line (LED), is not 1,2,3,4.. as you might expect but is 1 2 4 8 16 32 64 and 128 Check this listing carefully ensuring you understand how it works since the concept on which it is based is the foundation of all computer control technology. Each line represents a place in the binary number system. Thus the first line is units, second is 2s, third 2x2s, fourth 2x2x2 etc or in a denary number system: 1, 2, 4, 8 respectively. Our row of LEDs permits us to demonstrate the binary number system rather well as the next three listings illustrate. **Listing 3** counts up to 255 in binary, switching on each light in numerical sequence. **Listing 3B** allows a denary number to be entered and displays it in binary with the LEDs. **Listing 3C** is simply an extension of listing 3: displaying the count on screen as it lights the LEDs.

Where Next?

The project outlined above is only the beginning of a number of increasingly complex control applications based on the interface described. Some of them include: – a sound/light metronome – traffic lights simulation – computer controlled slot cars – computer controller model train set These (and other projects utilising the analogue port), are fully explained in Thomas Nunn's book. If your appetite is whetted and you would like try other control projects, then you are strongly advised to purchase a copy of this book. Your local LEA computer centre should also have a copy of MEP's CONTROL INSET pack. This is essential reading for any teachers seriously considering introducing children to the delights of computer control.

Factfile

- ***Sensing and Control projects for the BBC Micro* is published by Microbooks, 443 Millbrook Road, Southampton, SO1 0HX and is distributed by John Wiley & Sons Ltd, Baffins Lane, Chichester, West Sussex. It costs £5.95**
- **The Lego Buggy Interface is produced by RESOURCE, Exeter Road, Doncaster DN2 4PY ☎ 0302 63800. It costs £41.95 inc.**

  Accompanying Lego costs £64.95 whilst the Robot Arm and the RESOURCE interface is available from RESOURCE or from Logotron: Dales Brewery, Gwydir Street, Cambridge ☎ 0223 323656. Prices start at £88.95 (Interface £44.95)
- **The *Deltronics Buffer Box* is available from Deltronics, Heol-y-Parc, Cefnerthin, Llanelli SA14 7DL ☎ 0269 843728 and costs £94.95 inc.**

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Z88 Spellmaster for Pipedream	£51
Z88 to BBC Link	£21.70
Z88 to PC Link II	£30
Z88 EPROM ERASER	£34.75
Serial Printer Cable	£8.65
Parallel Printer Cable	£24.00
Z88 Modem	£145
Z88 Soft Carrying Case	£8.50
Sinclair Z88 Computing Book	£9.95
AA Nicad Rechargeable Battery	£1.50
Battery Charger, Compact & Fast (3 Hours)	£6

CO-PRO Adaptor

Now for the first time you can add the Master Co-processor boards, to your standard BBC model B, or B Plus. With this brand new launch from Watford Electronics you can attach any BBC Master co-processor to the original BBC Micro. Once again Watford strides ahead with a new concept in BBC B Micro add-ons. This unique external Co-Pro Adaptor, is protected by patent applications.

Use the super fast Turbo Board with your BBC B, it is much faster than the 6502 2nd processor superseding it.

With the 512K addon your standard BBC machine achieves IBM PC compatibility at a realistic price running GEM, Lotus 123 and many other programs. Included with the 512k package is a high precision mouse and the Digital Research GEM suite of software; GEM Desktop, GEM Write GEM Paint. This requires both the 1770 DFS and the ADFS to be fitted to your computer.

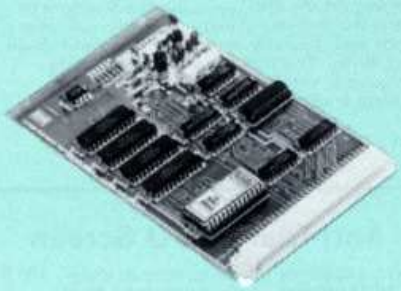
To use other co-processors you require a BBC B with DNFS 1.20 or higher, or BBC B+ fitted with 1770 DFS 2.20 or greater. Co-processors work exactly like a second processor.

Master owners may use Co-Pro to add a second Co-processor externally.

Watford, brings power to your BBC at only:

£35 (carr £5)

Archimedes Real-Time Digitiser



Watfords' Archimedes Video Digitiser is the most sophisticated digitiser ever designed for a micro. It provides a fast and flexible means of capturing images from a video camera or recorder for display and manipulation on the Archimedes range of Micros. Off-air television signals may also be digitised via a video recorder or TV tuner.

Once captured, Video images can be stretched, squahsed, rotated, stored on disk, printed, or used by applications software.

Applications include desktop publishing, graphics, animation, image analysis and recognition, medical imaging, automatic inspection and measurement, databases, interactive video, remote transmission of pictures via a modem, movement detection ... or anything else you can think of!

SPECIFICATION

SOFTWARE

All the driver software for the digitiser is contained in a ROM on the podule. Facilities provided include:

- Grabbing of images to the screen or dumping to memory.
- Continuous grabbing and display for previewing or camera alignment.
- 'Hot key' grabbing – pressing a (configurablel key combination grabs and displays an image on the screen while another program (e.g. paint software such as Artisan) is running.
- Scaling (zoom/shrink) any section of an image to any size in X and Y directions, with optional X/Y flip, window clip and logical (AND/OR/XOR) plotting.
- Rotation and scaling to any angle and size, rotating about any point, with optional window clip, and logical (AND/OR/XOR) plotting.
- Very versatile matrix printer screendump facility for Epson FX, LQ and EX compatible printers – pictures can be printed to ANY size (including multiple sheets) at any orientation, using any available printer density and one of six internal sets of dot patterns, or with user definable patterns (pattern editor supplied). The screen-dump can also be used for general purpose graphics screen printing.
- Pixel value lookup tables: pixel values can be passed through a user defined lookup table to allow contrast enhancement, thresholding pseudo-colouring etc.
- Smoothing and noise spot removal to enhance image quality.
- Creation of sprites from all or part of a digitised image.
- Saving and loading of digitised images in compressed format.
- Combination of pictures by adding, avaraging, subtracting, multiplication etc.
- Much faster versions of the Arthur *ScreenLoad and *ScreenSave commands.

Software facilities are accessed via operating system star (*) commands and SWI calls. High resolution screen modes using MultiSync type monitors are supported.

UTILITY DISK

A disk is included, containing sample pictures, examples and utility programs including the following:

- Colour image grabbing using colour filters with monochrome or colour cameras, including colour balance adjustment and scaling facilities.
- Pattern editor for 2 colour display modes and printer screendumps.
- 512 line interlaced display for non MultiSync monitors.
- Thresholding to create two colour images.
- Capture and replay of animated sequences.
- Several example programs illustrating the use of digitiser software.

RESOLUTION

Images are digitised to 512 (h) x 256 (v) pixels, and then scaled to fit the Archimedes' screen. It is possible to digitise to 512 x 512 pixels if the picture is stationary for about 0.1 second. 512 x 512 images can either be displayed on a MultiSync monitor, or on a normal monitor using interlacing.

Pictures are digitised to 64 levels of grey (6 bits). Note, however, that it is only possible to display all 64 levels on a monochrome monitor, or a colour monitor which has a composite (CVBS) input. For this reason, the Philips CM8533 monitor is recommended instead of the standard Archimedes monitor. It is also possible to connect both a colour and a monochrome monitor at the same time.

Any 2,16 or 256 colour graphics mode can be used to display digitised pictures. In two colour modes, grey levels are represented using dot patterns, which may be redefined if required (a pattern editor is supplied).

SPEED

Video fields are captured in real time (1/50th sec.), and then transferred to Archimedes' memory or the screen. The grab/display rate is dependant on the screen mode and picture size, up to 25 fields per second for quarter screen images, or 12.5 per second for fullscreen (Mode 9).

HARDWARE

The digitiser is a single width podule, with a BNC socket on the rear panel for the video input, which may optionally be terminated via a link. There is 128K of on-board memory to store the digitised image, and a 32K ROM on the podule contains all the driver software.

Automatic video level control and black level clamping circuitry is used to ensure that the optimum contrast is obtained from a variety of video sources. A filter is included to avoid patterning effects when using colour sources.

Price £249

Watford Electronics are Appointed & Authorised DEALERS / REPAIR CENTRE for Acorn Computers Ltd Microvitec Monitors Panasonic Printers

NEW

BBC PCB DESIGNER

At last! A PCB design package for the BBC Micro that eclipses some industry CAD software. Hard to believe, isn't it? Just look at some of the impressive package specification:

- Library Component Designer
- Component Library (over 200 parts)
- Component List Editor
- NetList Editor
- PCB Board Designer
- Plotter Driver
- Dot Matrix Printer Driver

This integrated suite of programs is packed full of sophisticated PCB related features making the design of a circuit board a dream instead of a nightmare.

Input for the design may be manual or Auto mode.

Some of the PCB Designer's features are:

- Over 120 library pad sizes/shapes
- Four colour adjustable palette
- Zoom range 2:1 to 1:4
- Highlighting of specific tracks
- Normal and surface mounted components
- Rapid screen review
- Menu driven
- Variable gridlock
- Switchable measurement grid
- Pre-select pan/scroll facility
- Large 24" x 24" Board size
- Copy route facility
- Connectivity held at all times
- Ratsnesting of part connections
- Auto-plaement of text references
- Text linked to parts
- Automatic placement of vias
- Printer and plotter outputs provided
- Comprehensive manual

TYPES OF PLOT OUTPUT

Top and bottom track artworks, top and bottom silkscreens, solder resist mask, drilling detail drawing and check plot. All these may be with pad holes on/off, scale of 2:1 or 1:1, board edge on/off, 90 degres rotation, mirror image, width of pen, x & y offsets and batch plots to disc.

The above is only a taste of the superb features of this software, surely capturing previously unknown performance from the BBC Master computer. BBC B owners will need to fit at least one block of sideways RAM, Shadow screen memory and a disc drive. A trackerball or a mouse is also required.

Introductory Offer: £99

(Please write in for further technical details)

Continued

MONITORS & SWIVEL BASES

All Monitors are supplied complete with BBC connecting leads FREE.

MICROVITEC 14"

- 1431 – Standard resolution as used on the BBC television computer programme **£175**
- 1451 – Medium resolution, suitable for word processing in mode 0 **£225**
- 1441 – High res, exceeds the capabilities of the BBC micro **£359**
- 1431AP RGB + PAL and AUDIO **£199**
- 1451AP RGB + PAL and AUDIO **£255**
- **2030 CS 20" Med Res** **£380**
- **2040 CS 20" Hi Res** **£675**
- Dust Cover for Microvitecs **£5.50**
- Touchtec 501 Touch Screen **£239**

TAXAN 12" & 14"

- **TAXAN Super Vision 2 Type 620** Hi-res RGB Colour monitor. Ideal for Wordprocessing **£263**
- **TAXAN Super 3, Type 625** Ultra Hi-res, RGB Colour) Text mode switch allows monochrome text display in Green, Amber, White reverse or White on Blue **£313**
- **TAXAN 14" Multisync 770 Plus** – An autoscanning Ultra high res, colour monitor. Ideal for Archimedes, IBM & Compatibles **£495**

- **NEC JC-1401P3EE 14"** Multisync Ultra Hi-res Intelligent Colour monitor. Auto scans frequencies between 15KHz to 35KHz. Text switch provides 7 colours for Database & wordprocessor. **£489**

PHILLIPS Monochrome 12"
BM7502 Hi-res Green **£69**

STAR BUY

- **PHILLIPS 14** Hi-Res, dark glass, attractively finished Colour Monitor supplied complete with RGB, SKART and Audio/Phono Inputs. A push-button switch toggles between Hi-Res monochrome green text mode and full colour display. (Please state the type of Connecting Lead you require).

ONLY £195

Dust Cover for above Phillips Monitor **£6**

NEW

SPECIAL OFFER
AMBER MONITOR

BT MERLIN 12" Hi resolution Amber monitor. Ideal for wordprocessing. Consealed front panel mounted controls. Illuminated mains neon rocker switch. Supplied complete with BBC Cable.

Only £49
(Offer valid while stocks last)

N.B. carriage on Monitors **£7** (securicor)

SPARE LEADS

BNC Lead for Zenith or Philips	**£3**
Skart Monitor Lead	**£5**
RGB lead for TAXAN Monitors	**£3**
Archimedes Colour Monitor Lead	**£7.50**

for Video Monitors
By placing your monitor on one of our professional swivel bases (see monitors drawing on the left), you gain the freedom to adjust the monitor viewing angle to suit your needs and thus alleviate eye strain and reduce back stress. The front mounted adjustable control dial makes adjusting the monitor viewing angle very simple.

for 12" Monitors **£7** (carr. £2.50)
for 14" Monitors **£10** (carr. £2.50)

Anti-Glare VDU Screen

These extremely effective, easy to install, 12" & 14" VDU screens eliminate harmful glare, improves contrast on colour monitors. Increases productivity in offices. A must for all wordprocessor users. Hundreds of these screens are in daily use in various branches of one of the leading High Street banks.

£12

TAXAN KP-815 PRINTER

80 column, Bi-directional, 160 CPS, (NLQ 24cps); Friction & tractor feed + paper roll holder as standard; Epson FX compatible.

Offer Price £159

Taxan KP915 132 Column Printerr (carr £7)	**£275**
RS232 Interface	**£49**
RS232 Interface with 2K Buffer	**£69**
RS232 Interface with 16K Buffer	**£89**

Panasonic KX-P1081

Attractively finished in BBC beige. Bi-directional, logic seeking. Has IBM and Epson RX compatible command calls. Speed: 120CPS draft mode, 24 CPS NLQ mode. Character width range from 5 cpi to 17 cpi. Upto 40 downloadable characters. Functions include, Proportional spacing, Justification, centering and left & right ranging.

(Price inludes, FREE a 4ft Printer Lead, and a Dump Out 3, Screen Dump ROM worth £35 with every printer purchased from us).

Special Price: **£145** (carr. £6)
Optional RS232 Interface: **£39**

Panasonic KX-P3131 Daisy-Wheel Printer

Low-cost, high performance; Bi-directional, Logic seeking, Proportional spacing, 10, 12 & 15 CPI, Speed 17CPS. 6K Buffer.

Only **£255** (carr. £7)

Single Sheet Feeder	**£175**
Tractor Feed	**£90**
Daisy Wheel (various)	**£12**
Ribbons: Standard **£4.50**; Long Life **£7**	
Extra 32K Printer Buffer (internally fitted)	**£10**

Panasonic KX-P4450 LASER PRINTER

Now available from stock. Please write in for technical details

NEC P2200 PINWRITER

24 pin; 80 column; 168CPS – 56CPS LQ; Epson LQ compatible, 7K Buffer; 7 resident FONTS, Friction & Tractor feed, front load single sheet feed, etc.

Price: £275

Cut Sheet Feeder	**£65**
Additional Font Cartridge	**£25**
NEC P2200 Pinwriter Ribbon	**£6**

NEW

NEC PINWRITER P6/P7 Plus

The Ultimate matrix Printer for Business.

It took time to make it from the drawing board to the business office, but the Pinwriter P6 Plus the 80 column width and P7 Plus wide carriage printers are finally here. They are equipped with just about all the capabilities you could ever need.
Some of the features are:

- Print Speed, 265cps in Draft and 90cps in letter quality.
- Inbuilt Tractor & Friction feed.
- A paper park & low tear of facility.
- 20 inbuilt FONTS as standard.
- A Font cartridge facility.
- 80K byte Printer Buffer as standard.

Added to all this is a 24 Pin printhead for high quality output, their Centronics parallel interface for easy connection to your computer. Both Pinwriters are software compatible with previous NEC 24 pin Printers, Epson LQ800/1000 & IBM XL24. Colour option is available (optional extra). All this at our launch offer prices of:

P6 Plus 80 columns	**£415**
P7 Plus 136 columns	**£490**
Cut Sheet Feeder	**£125**
Colour Option	**£74**
Serial Interface	**£73**

(For further details, write in for our technical leaflet).

EPSON PRINTERS

EX800	**£415**	LQ850	**£469**
EX1000	**£569**	LQ1050	**£599**
FX800	**£315**	LQ2500+	**£825**
FX1000	**£425**	LQ2550	**£899**
GQ3500 Laser	**£1290**	LX800	**£199**
LQ500	**£285**	SQ2500	**£975**
Star LC10	**£175**	LC10 Colour	**£219**

PLOTTERS

Hitachi 672 Colour Plotter	**£475**
Plotmate Plotter A4S	**£379**
Plotmate Plotter A3M	**£549**

CUT SHEET FEEDERS for
EX800 **£130**; EX1000/LQ25550 **£195**; FX800 **£135**; FX1000 **£169**; LQ/LX800 **£125**; LQ850 **£135**; LQ1050 **£175**.

TRACTOR FEED for
EX800/1000 **£78**; LQ800 **£44**; LQ850 **£69**; LQ1050 **£75**; LQ2500 **£195**

ACCESSORIES

- EX800/1000 Colour Option **£55**
- EX800/1000 Colour Ribbon **£18**
- LQ2500 Colour Option **£65**
- Epson Paper Roll Holder **£19**

(Securicor Carriage on Printers £7

EPSON PRINTER INTERFACES

All these interfaces fit inside the printer.

RS232	**£27**	RS232 + 2K Buffer	**£52**
IEEE 488	**£65**	RS232 + 8K Buffer	**£62**

Universal Printer Sharers/Changers

Connect upto 5 Micros to 1 printer or 5 Printers to 1 Micro with our combined, Sharer/Changer. These Units are made to a very high standard. For extreme reliability, they all have Printed Circuit Boards mounted inside the case, (not a Spagetti Junction of wires). Internal connection is made via high quality ribbon cables.
(Ideal for School environments.)

Connects	Serial	Centronics
2 to 1	£24	£25
3 to 1	£34	£35
5 to 1	£44	£45

(Cables extra at £6 each. Please specify type required when ordering)

INTEGREX COLOUR JET PRINTER

- Colour Jet 132 Printer £515
- Paper Roll £6
- Screen Dump Software £10
- Colour Cartridge £14
- Black Cartridge £8
- 100 A4 OHP transparencies £55

Professional Printer Stand

This new professional printer stand takes hardly more space than your printer. Due to the positioning of the paper feed and re-fold compartments ie. one above the other, the desk space required for your printer functions is effectively halved. Additional facilities include: Easy access to paper from both sides, used with both top and bottom feed paper and with its dial controlled paper feed system with adjustable deflector plates it ensures smooth paper flow and automatic refolding.

80 Column version £23 (carr. £2.50)
132 Column version £26 (carr. £2.50)

PRINTER LEADS

Centronics lead for the BBC

Standard length (4 feet long)	*£6*
Extra long (6 feet long)	*£8*
Compact's Special Centronics Lead	*£7*
Archimedes Printer Cable	*£7*
RS232 Cable	*P.O.A.*
IBM/Archimedes Parallel 1 metre lead	*£7*
Double ended 36 way Centronics Lead	*£9*

PRINTER RIBBONS & VARIOUS DUST COVERS

Type	*Ribbons*	*Dust Covers*
BBC Micro	–	***£3.50***
BBC Master	–	***£4.00***
Archimedes Micro pair	–	***£9.00***
Brother HR15/20	***£3.00***	***£5.00***
DMP2000	***£4.00***	***£4.75***
EX/LQ800	***£7.50***	***£4.50***
EX/LQ1000	***£8.00***	***£5.00***
RX/FX80/85/800/MX80	***£4.00***	***£4.95***
RX/FX100/1000	***£6.00***	–
Kaga/Texan KP810/815	***£5.25***	***£4.00***
LQ2500	***£9.00***	***£5.50***
LX80/86/800	***£4.00***	***£4.50***
M1009/GLP	***£4.00***	***£3.75***
Panasonic KX1080/81	***£4.50***	***£4.75***
SQ2500	***£25.00***	***£5.50***
Star NL10	***£4.00***	***£4.50***

Our attractive Dust Covers are manufactured from translucent PVC. The seams are stitched and edges are taped to prevent splitting due to continuous use.

Listing Paper (Perforated)

- *1,000 Sheets 9½" × 11" Fanfold Paper* ***£7***
- *2,000 Sheets 9½" × 11" Fanfold Paper* ***£12***
- *1000 Sheets 9½" × 11" NCR 2 Part Fanfold* ***£19***
- *1,000 Sheets 15" × 11" Fanfold Paper* ***£9***
- *1000 Sheets true A4 Fanfold Paper* ***£11***
- *2000 Sheets true A4 Fanfold Paper* ***£19***
- *Teleprinter Roll (Econo paper)* ***£4***

(All our Fanfold paper is Micro perforated leaving a smooth clean edge when the tractor feed strips are detached).

Carriage 1K Sheets £2.50. 2K Sheets £3.00

PRINTER LABELS

(On continuous fanfold backing sheet)

1,000 90 × 36mm (Single Row)	***£5.00***
1,000 90 × 36mm (Twin Row)	***£4.90***
1,000 90 × 49mm (Twin Row)	***£7.50***
1,000 102 × 36mm (Twin Row)	***£6.25***

Carriage on 1,000 Labels £1.00

MEGABUFFER 256

This new Megabuffer 256 from Watford is a full featured 256K Printer Buffer. It allows the computer to print 256,000 character in a short time thus freeing the computer very quickly. In short it makes light work of printing large documents, screen dumps, etc. It is extremely simple to connect. The features are:

- Low Cost, High performance.
- Improves efficiency by making more efficient use of computer and printer.
- Compatible with any computer and printer that uses Centronics Parallel connections including all BBCs, IBM PCs, etc.
- Total compatibility with all software.
- Cheaper phone bills when using your Modems.
- Ideal for those doing large graphics screen dumps that are slow to print.
- Multi-Copy facility allows you to print several copies via Megabuffer without going through your computer.
- Data Dump facility is included.
- Built in test unit for both the buffer & your printer.

In conclusion it can safely be said that MEGABUFFER 256 is the ultimate printer Buffer for both the amateur and professional user.

***Only £179** (carr £2)*

OFFICE MASTER

CASHBOOK – A complete "Stand Alone" accounting software package for the cash based sole trader/partnership business. It is designed to replace your existing cashbook system and will provide you with a computerised system complete to trail balance.

FINAL ACCOUNTS – Will take data prepared by the Cashbook module and produce a complete set of accounts as following: Trial Balance with inbuilt rounding routine; Notes to the accounts; VAT Summary; Profit & Loss A/C; Balance Sheet.

MAILIST – A very versatile program. Enables you to keep records of names and addresses and then print, examine, sort and find them, all with special selection techniques.

EASILEDGER – A management aid software tool designed to run alongside an existing accounting system. Essentially a Debit/Credit ledger system which can handle sales, purchase and nominal ledger routines to provide instant management information.

INVOICES & STATEMENTS – Greatly reduces the time and cost of preparing Invoices and Statements by storing essential information like customer names, addresses and account numbers. Has VAT routines and footer messages facility.

STOCK CONTROL – Allows you to enter stock received, stock out, summary of stock items and current holdings together with details of total cost, total stock to minimum level, units in stock ordering, quantity and supplier detail.

All this for only **£21** (Disc)

OFFICE MATE

- DATABASE
- BEEBCALC SPREADSHEET
- BEEBPLOT GRAPHICS

DATABASE – Set up a computerised card index system with powerful search facilities.

SPREADSHEET – Offers many calculation and editing features.

BEEBPLOT – Provides visual representation from Spreadsheet data.

OFFICE MATE Only £10 (Disc)

New Launch Offers
Disc Drives DP35-800S

A Double disc drive – with a difference! Times are changing fast for the floppy disk, and whilst the current standard for the BBC B and Master Series is the 5.25 inch disk, the standard for the future will most certainly be the smaller; faster and more reliable 3.5 inch disks – now a standard feature of both the Master Compact and the Archimedes Series.

To support the present disc drive users, and cope with the future, we have designed our own plinth-mounted disk system – called the DP35 800S, it contains both the 5.25 inch and the 3.5 inch drive formats as well as offer a firm and rigid support for a monitor on top. With the BBC Micro underneath, the plinth makes a surprisingly small footprint on the desk – leaving you more space to work with.

The 5.25" disc drive is 40/80 track switchable. For ease of access, the switches are front mounted. DP35-800S has its own power supply, independent of the BBC Micro.

Watford's new plinth enables users to read, write and format disks both in DFS and ADFS format – currently the accepted standard for the Master Compact and the Archimedes, it also enables the user to read disks written for the Archimedes. Ideal for both BBC & Master.

Launch Offer: **£165** (carr. £7)

OKIMATE COLOUR PRINTER

The first ribbon transfer printer in its price range which offers fully versatile colour or black printing. A 24 element print head produces more than 100 shades with exceptional clarity. Ideal for use with Quest Paint or AMX Super Art.

Only: **£119**

BBC Screen Dump	£10
Colour Ribbon	£6
Black Ribbon	£6

THE EPSON RX-FX-KAGA PRINTER COMMANDS REVEALED

So you bought yourself a new printer, because the salesman in the shop showed you how clever it is and impressed you with all sorts of printouts to show its capabilities – he may even have offered you a special price.

However, now that you have got it home and connected it to your BBC microcomputer, you are wondering how to make it perform these magical tasks. The manual seems to give no clues, and when you type in the example programs, the computer throws the LPRINT statements back in your face.

Now what do you do, when this £400 piece of high technology refuses even to move its head, and you have stayed up until 2 in the morning with copious supplies of coffee, desperately trying to print something out. Once again, Watford Electronics comes to your help with our new book entitled 'THE EPSON FX-KAGA PRINTER COMMANDS REVEALED'.

This book describes in plain, easy to understand English, how to use and make the most of your KP810, PW1080A or any other Epson FX80 compatible Printers like Panasonic KX-P1080/1, etc., with the BBC Micro, both from BASIC and Wordwise.

It describes in detail how to obtain the maximum in graphics capability from your printer and includes full indexes allowing you to cross index the numerous commands. Every command is explained in detail, with an accompanying BBC Basic program and an example of its use from Wordwise.

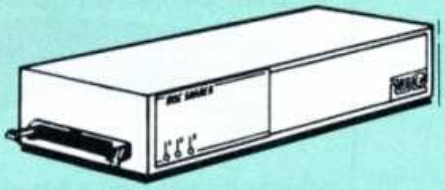
£5.95 (No VAT)

CREDIT CARD 24 HOUR
Ansaphone Hot Lines
(0923) 50234 or 33383

Continued

NEW

DISC DRIVE SHARER



(Ideal for educational establishments)

At last, a low cost alternative to the Econet system. Watford's Intelligent Disc Drive Sharer allows you to connect 3 BBC micros (model B, B+ and Master series) to a single or double disc drive. Running under any DFS or DDFS, this intelligent unit will automatically queue the computers. Each computer has a status light dedicated to it. If it is green you will get immediate access to the disk, and red means that you are next in line. The unit plugs directly into the disc drive socket on each computer and is powered by the mains. (N.B. Not for use with ADFS.)

Launch Price: **£65** Price includes 3 Cables

NOW WITH EXTRA FEATURES AT NO EXTRA COST – Watford's latest DFS 1.44

- Incorporates Acorn's Official Tube Host Code so that those with 2nd processors no longer need to waste a ROM socket on the DNFS.
- Option to DOUBLE the speed of BPUT and BGET.

WATFORD's & ACORN's SINGLE DENSITY DFS

Watford's popular and widely acclaimed DFS has now been available for five years and has gained a large following amongst serious and educational users of the BBC Micro. Owners of Acorn or any other standard DFS can upgrade to our "Ultimate" DFS merely by replacing their DFS ROM. See below for this upgrade. ***(P.S. Watford's highly sophisticated DFS is fully compatible with Acorn DFS). (not Acorn's 1770 DFS)***

- *Complete Disc Interface Kit including DFS ROM and fitting instructions* **£58**
- *Acorn's 0.90 DFS Kit complete* **£59**
- *DFS Manual (Comprehensive)* *(no VAT)* **£6.95**

(P.S. Our DFS manual is the only comprehensive Manual available for the BBC micro and covers both Acorn & Watford DFSs).

- *Watford's sophisticated DFS ROM only* **£16**
- *We will exchange your existing DFS ROM for Watford's Ultimate DFS ROM for only* **£12**
- *DNFS ROM only* **£17** • *ADFS ROM only* **£25**

NEW

Watford's Mk II Double Density DFS INTERFACE

Many of our customers have wanted to use our superior DDFS and Acorn ADFS together. Now our MkII DDFS board has been adapted to allow the use of Acorn ADFS as well. It also has all the commands of the Acorn's 1770 DFS, plus the added features:

Added features include:

- Acorn ADFS compatible – Use ADFS on our DDFS board.
- Tube host Code – No longer any need to have the DNFS in your machine to use Co-Processors, even the CoPro and Master 512.
- Auto 40-80 Track sensing – no need to fuss with 40/80 track switches (even works with protected disks).
- An extremely powerful 8271 emulation – ensuring compatibility with almost all software.
- New low profile – small footprint board.
- Fits with all third party ROM boards.
- Option to double the speed of file handling operations – BPUT and BGET.
- Operates in both single and double density modes.
- OSGBPB has been recoded, increasing still further the speed of file handling.

Please note that not all DDFS's are capable of providing either the full 80% storage increase or of allowing a file the full size of the disk – Ours allows both of these!

If you already have a DDFS (any manufacturer), and wish to upgrade to our MkII version, then simply return your existing ROM and DDFS board and we will supply the new DDFS for only **£30.00**.

- Special introductory offer **£39.00**
- DDFS Manual (No VAT) **£6.95**
- We will exchange your existing DFS Kit for our sophisticated DDFS for only **£25.00**

Please note, as the MkII DDFS is a hardware and software upgrade, it is not possible for existing Watford DDFS users to simply exchange their ROM for the new version.

DUST COVERS (For our Disc Drives)

Single CLS (without PSU) **£3.20** Twin CLD (without PSU) **£3.85**
Single CS (with PSU) **£3.95** Twin CD (with PSU) **£3.90**

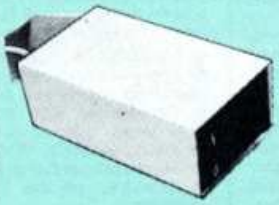
SPECIAL DISC DRIVE/DDFS OFFER

Type CLS400S

- The popular Mitsubishi 400k Single Disc Drive, Double Sided, cased with Cables. Plugs directly to your Micro.
- Watford's popular DDFS Disc Interface (allows 720k storage). Will run in both Single and Double Density modes 40/80 track Software switchable.
- A comprehensive User Friendly Manual.

A Bargain at Only **£125** (£6 carr)
(Offer valid while stocks last)

3½" DISC DRIVE OFFER



These top quality 3½" Double sided, 80 track, 1 Megabyte (unformatted each Disc Drives), are attractively finished in BBC beige. They are supplied complete with all cables and a Utilities Disc. They run directly from the BBC B/Master's own PSU.

- **CLS35 400K Unit** **£69**
- **CLD35 800K Unit** **£126**

Mysteries of Disc Drives & DFS Revealed

Are you tired of faulty cassettes, and lengthy loading times? Do you want to upgrade your BBC micro to take discs but you get tied up in the plethora of jargon surrounding the choice and use of these systems.

Then The Mysteries of Disc Drives and DFS Revealed is the book for you. It explains in detail the different types of systems available, how they are installed and how to use them. Many examples are given including pre-written programs to call various functions of the DFS available only through Operating System calls. Different types of disc, 40/80 tracks etc. are all explained. This book is ideal for the beginner confused by the plethora of choice available in the marketplace.

£5.95 (Book No VAT)

DISC ALBUMS

Attractively finished in antique brown leather look vinyl. Stores upto 20 Discs. Each disc can be seen through the clear view pocket.

£4

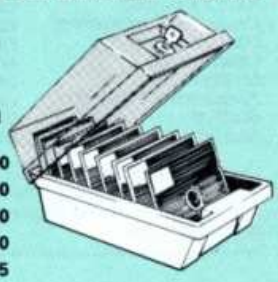
FLOPPY HEAD CLEANER KIT

The heads in floppy drives are precision made and very sensitive to dirt. The use of a cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. It is very simple to use. Available in 3½" & 5¼", please specify.

£6

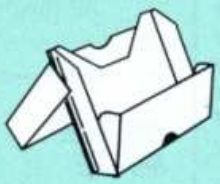
ANTISTATIC LOCKABLE DISC STORAGE UNITS

Gives double protection – Strong plastic case that affords real protection to your discs. Antistatic helps avoid data corruption whilst in storage. The smoked top locks down. Dividers and adhesive title strips are supplied for efficient filing of discs.



- **M35** - holds upto 50 5¼" discs **£6.00**
- **M85** – holds upto 95 5¼" discs **£8.00**
- **M25*** – holds upto 25 3 ½" Discs **£5.50**
- **M50** – holds 50 3½" Discs **£7.50**
- **M10** – holds upto 10 Data Cartridges **£15**

* Not lockable



PLASTIC LIBRARY CASES

Holds up to 10 5¼" Discs. **Only £2.00**

DISC PLONKER RACK

When using ones micro, there is a tendancy to have more than one Disc on the desk. This exposes them to the hazards of fingerprints, scratches, dust, coffee and an untidy desk.

Why not protect your valuable data from all these hazards with the help of our extremely handy and low cost DISC PLONKER RACK. It holds up to eight 5¼" Discs.

Protection at Only: **£2**

Quality Disc Drives from Watford

To help you decide which drive is the most suitable for your needs (and your pocket!), we have produced the table below.

The first capacity given in the first column indicates capacity in single density mode. That within the brackets is the capacity in double density mode. All disc drive type numbers start with the prefix "C".

The tinting on some of the boxes is used to indicate which Drives are 40 track (non-tinted) and which are 80 track (tinted). All our 80 track drives are already fitted with a 40-80 select switch.

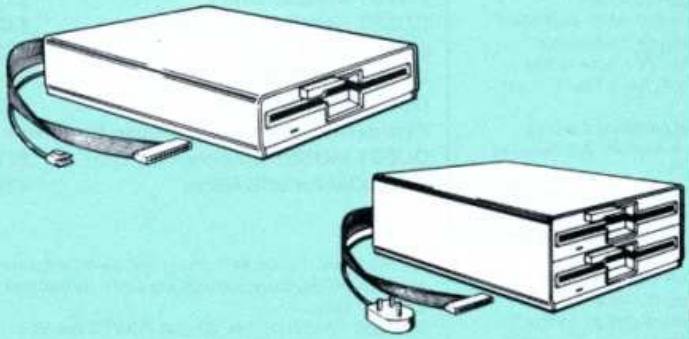
***All our Disc Drives are Double Sided and will operate in both Single and Double Density modes.** Extensive experience of the usage of disc drives suggests that the JAPANESE drives currently represent about the best in terms of speed, reliability and overall "elegance" available for the BBC Micro.*

Various other "manufacturers" of disc drives for the BBC micro (more accurately, "packages" label other manufacturers drives with their own name). We buy the high quality JVC and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public.

If you look around the popular BBC micro press, you will find that the prices we quote for the top quality, new slimline disc drives are, virtually without exception, some of the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal.

Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate (extensive tests within our workshops have confirmed this). All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. Ideal for Schools & Colleges. We are now able to supply all single disc drives with Power Supply, in either single or dual case. (Dual case has a twin data cable and a power supply capable of driving two disc drives) allows easy expansion to a dual drive unit, at a later date. Prices stated in the pricing boxes below are for single drives in standard single cases. Single drives in a dual case cost an extra £5. (At Watford we anticipate your needs of tomorrow, not just today)!

When using a BBC Micro, most people find themselves short of desk space. The Watford's BBC Micro plinths form an ideal way of recovering some of this precious space) your BBC, Disc Drive and Monitor can all occupy the same vertical footprint and still be comfortably situated. With the Watford Double plinth, your Disc Drive is mounted vertically at one side, leaving a very valuable area directly in front of you for such useful items as spare discs, pen, paper, reference manuals, etc. Follow the trend with Watford plinth. (Turn to the 6th page of our advert for the Plinths).
P.S. All our 5¼" Disc Drives with PSU are compatible with the Compact Micro. All you require is the special Compact Disc Drive Cables designed by us.



Capacity	Drives without P.S.U.		Drives with P.S.U.	
	Single	Twin	Single	Twin
200K (360K)	CLS 200 £89		CS 200 £98	
400K (720K)	CLS400S £82	CLD 400 £168	CS 400S £92	CD400 £188
800K (1.44M)		CLD 800S £162		CD 800S £182

● TWIN Disc Drive Case, complete with Power Supply & Cables **£43**
Securicor carriage on Disc Drives £5 to £6

Prefix ***C*** *= Cased Drive*
L *= Less PSU*
S *= Single*
D *= Double*

Suffix ***S*** *= 40-80 Switchable*

e.g. CLS400S = Cased Disc Drive, Less power supply unit, single 5¼" 400K, (720K in double density); Double sided; 40/80 track switchable.

Cable to connect 5¼" Disc Drives to BBC Compact
Single £9 Twin £12
Special Cable to connect both 3½" and 5¼" Disc Drives
simultaneously to the BBC Compact £13

3M – DISKETTES

3M – SCOTCH Diskettes with Lifetime warranty from Watford Electronics your 3M Appointed Distributor.

- *10 × 5¼" S/S D/D 40 Track Diskettes (744)* **£6.00**
- *10 × 5¼" D/S D/D 40 Track Diskettes (745)* **£7.50**
- *10 × 5¼" S/S D/D 80 Track Diskettes (746)* **£11.50**
- *10 × 5¼" D/S D/D 80 Track Diskettes (747)* **£11.75**
- *10 × 5¼" 1.6M D/S D/D High Density Discs for IBM XT and AT* **£19**
- *10 × 3½" S/S D/D 40/80 track Discs* **£10.00**
- *10 × 3½" D/S D/D 40/80 track Discs* **£11.75**
- *10 × 3½" High Density Diskettes* **£37**

TOP QUALITY 3½" & 5¼" DISKETTES

To complement our range of Quality Discs and Disc Drives, WE are now supplying SPECIAL OFFER packs of 10 Lifetime guaranteed discs. Each disc has a reinforced hub ring. Supplied complete with selfstick labels and a Plastic Library Disc Box.

- *10 × **M3** 3½" D/S D/D 80 Track Discs* **£13**
- *10 × **M4** 5¼" S/S D/D 40 Track Discs* **£5.00**
- *10 × **M5** 5¼" D/S D/D 40 Track Discs* **£7**
- *10 × **M7** 5¼" D/S D/D 80 Track Discs* **£9**
- *3" Double Sided Discs* **£3** *each*

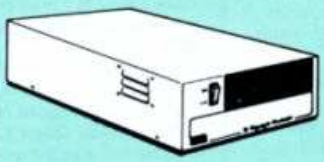
PRICES SLASHED

Special BULK OFFER on 5¼" DISCS

(Supplied packed in Anti-Static Lockable Storage Units)
(Lifetime warranty on Discs)

BULK PACK DISCS in lots of 100

Type	S-S 40T	D-S 40T	D-S 80T
● Without Sleeves	£35	£39	£45
● With Sleeves	£38	£42	£48



WATFORD's WINCHESTER DRIVES

Undoubtedly the best value for money Winchester Hard disc available anywhere for the BBC Micro.

This 30 Megabyte hard disc is completely compatible with the Acorn ADFS – that's why we have bundled it with each Winchester drive, along with a full user guide and full utilities including file copy, 1000K save routines, Format and Verify – in fact all you need and more.

Finished in rugged metal and fetching BBC beige, the Winchester has an internal fan, so quiet you won't even hear it! A switched mode power supply and a neon-lit on/off switch are there along with a light on the hard disc to tell you when it is working – just compare the price with our competitors' 20 or 28 Mbyte discs!

Compatible with the Master, and the BBc B (with 17 X disc interface).

● 10 Megabyte **£350** 30 Megabyte **£425**

CDP800S **CDPM800S**

Twin 800K Double sided 40-80 track switchable disc drives mounted in an attractively finished Beige colour plinth for the BBC Micro. Supplied complete with integral power supply, cables and Utilities disc. The mains switch with neon On/Off light indicator, and the two 40/80 track switches are mounted on the front panel for ease of use.

CDP 800S for BBC Micro £192
CDPM 800S for Master £196
DP35-800 for BBC/Master £165
(For DP35-800S spec. see Page 4 of our advert)

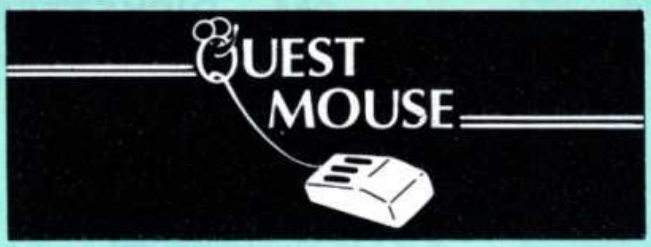
(Securicor Carr. £7)

(The above drive units are 2 Megabytes unformatted)

Continued

NOMINATED FOR BRITISH MICRO COMPUTING AWARDS 1987

QUEST MOUSE



QUEST MOUSE

The ultimate in Mouse technology, the Watford Electronics Quest Mouse must be the most powerful Mouse package yet produced for the BBC Micro. Featuring state of the art 32K ROM software the Quest Mouse package is filled with features essential to the budding artist. The Quest Mouse is a high precision, low profile and large footprint mouse. It has three large comfortable buttons and its RUBBER COATED STEEL BALL is smooth and easy to use on virtually any work surface. This also eliminates any directional bias that one encounters on the most well-known mouse for the BBC. The Quest Mouse is FULLY HARDWARE COMPATIBLE with the AMX MOUSE so that it will work with any of the AMX range of software.

The two parts of the Quest package are available separately so that existing Mouse owners can upgrade to the Watford's sophisticated Quest Paint software or replace their existing worn out mice for a minimum cost.

QUEST PAINT

The Quest Mouse software is supplied on a PALPROM unit to allow the sophisticated 32K program to be used from a single ROM socket. It is compatible with the BBC B, BBC B Plus and BBC Master Series machines.

The software is used to draw high resolution Mode 1 pictures in full colour. All menu selection and control of the drawing process is performed with the mouse so that you will hardly ever touch the keyboard.

SOFTWARE FEATURES

The software is far too powerful for us to describe it fully in such a small space. Below is a list of the various features. Please write to us for a fully descriptive leaflet.

Disk interface not required. Utilities disk has facility to create and print big screens. Colours applied can be solid, either pattern of user defined pattern. Drawing can use brush or airbrush. Brush shapes can be defined and stored. Airbrush sprays colour/pattern randomly with four jet sizes and even or center spread. Colour cycles. Colour protection to stop particular colours from being overwritten by selected drawing actions. All standard drawing facilities like: rubber, straight pencil lines, triangles, circles, ellipses, rectangles, parallelograms, polygons, etc are provided. All shapes can be solid or just a boundary line. Once a shape has been set up it can be repeated anywhere on the screen. Global colour replace in a rectangle. Powerful fill facility for areas and vertical/horizontal lines. Full cut and paste of rectangular areas with rotation and size with screens from Watford Beeb Video digitiser. Load and Save screens with colour pallet information, save brush and pattern definitions etc.

Take The Guesswork Out of Selecting a Mouse Package

With reviews like this how can you go wrong.

Popular Computing Weekly, 9-11 June '87
"What you actually get for your money is a well built, three button mouse (far superior to the AMX mouse)."
"Overall the combination of a quality mouse and decent art package gives Watford Electronics a real chance of supplanting AMX as mouse supremos."

Micro User June '87
"Quest Mouse and Quest Paint can hold their heads high in the market. . ."

A&B Computing June '87
". . . Watford Electronics, a company famed for excellent hardware add ons and versatile software packages. Called Quest mouse, "this is a very special mouse driven drawing package..."
". . . you will have one of the most comfortable and professionally built mice I have used in a long time. The buttons are responsive, the mouse movement is smooth and without directional bias – a pleasure to use."
"What we have here is probably the best art package there is for the BBC Micro . . ."
"Quest Paint is a major leap forward in BBC programming. . ."
"Quest Paint is an original piece of programming, it is friendly and well endowed with many useful facilities. I would comfortably say it is easier to draw good pictures with Quest Paint than it is with more expensive 'Professional' art packages for the Atari ST and the Commodore Amiga. A recommended buy if you are looking for the best in BBC micro based art packages".

Acorn User, September '87
"The mouse (Quest) performs well in the face of competition from AMX, Wigmore and the rest . . ."
". . . this package represents excellent value for money. If you are interested in art then this program is for you to buy".
"Given time, I can see no reason why Quest Paint shouldn't take on the title of the definitive art package available for the BBC Micro to date".
"All in all, Quest Paint is a very professional package. It contains virtually every feature the budding artist could require".
"What makes Quest Paint so versatile is the addition of a sub-menu which allows you extensive control over each function".
"Until recently, Superart from AMS had been judged as the definitive mode 1 graphics package for the BBC micro. But now it has a serious rival in the form of Quest Paint, from Watford".
"As a measure of what is contained within Quest Paint, I would say it had all the features of Superart plus . . ."
"In most art packages, provision is given for drawing triangles and rectangles. Quest Mouse goes 14 better, allowing any regular polygon of upto 16 sides".
"One facility, not found on any other Art package to my knowledge, is the ability to access a digitiser from within the program".
The reviewer concludes by saying, "The result is an extremely comprehensive and professional art package".

John Kilby, Head of Computer Science, Bishop Wulstan High School, Rugby, writes:
"Quest has been an excellent piece of equipment. The problem that seems to occur everyday is that at lunchtime the pupils rush to the computer room to make sure that they are first in the queue for the 'Quest' mouse".

Lt. Cln. C.G. Holton, G2 HQ 1 (BR) Corps, BFPO 39, writes:
"As ever your service is superb and the Quest Mouse proves every bit as good as the adverts claim".

Beeblet User Group, New Zealand Oct '87:
"One of its nicer features is that the top menu is done in Mode 0, the drawing itself is in Mode 1. Thus on screen together are two different Modes. A neat way around an old problem".

"PAN is used when a larger than one screen size image is required. The mind boggles at an A3 size drawing".

"I like it partly because of the mouse itself which is smooth and easy to handle but mainly I suppose because of the features I longed for and previously never got. Its easy to use with almost everything at your fingertips from the mouse. The software is simple where needed and complex where complexity is required".

ConQuest

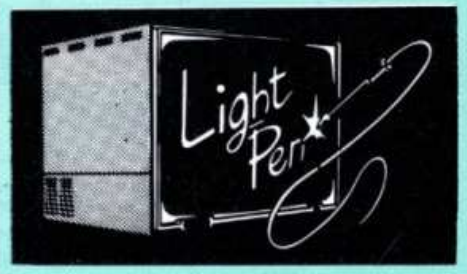
Watford's Quest package is an extremely powerful and flexible drawing package, with very wide and unusual features. However, since its launch various suggestions for even more advanced & powerful facilities were received from the Quest users. ConQuest allows you these more advanced facilities, like, distortion of a cutout to any shape and a full font designer. If you also have a GXR ROM in your machine or you are using a BBC Master then ConQuest will take advantage of this to give ellipses at any angle, sectors and arcs, etc. Quest combined with ConQuest and Acornsoft GXR ROM make up THE MOST POWERFUL drawing packages available for the BBC range. Quest Paint is able to take advantage of almost any additions to your machine, such as Shadow or Sideways RAM. ConQuest takes this principal even further, by utilising the otherwise normally incompatible Sideways RAM facility by holding pictures in them.
Some of the features are:

- *Pick filenames off the screen for loading and saving.*
- *Rotate a cutout to any angle and Distort it to any four sided shape.*
- *Has Built in Font editor.*
- *Default brushes and patterns on startup.*
- *16 x 16 font available on start up.*
- *Ability to reset patterns, fonts and brushes to default at any time.*
- *ROM based enhanced Epson and compatible printer dump.*
- *ROM based enhanced extended picture routine.*
- *Ability to create and abort extended pictures.*
- *Improved disk access speed for extended pictures.*
- *User definable sideways RAM driver for incompatible sideways RAM systems.*
- *Ellipses at any angle on Master 128 (or B with GXR ROM).*

QUEST MOUSE & QUEST PAINT	**£54**
QUEST MOUSE, QUEST PAINT, AMX PAGEMAKER & PAGEFONT	**£82**
QUEST MOUSE ONLY	**£25**
QUEST PAINT SOFTWARE	**£32**
QUEST FONT DISC	**£12**
ConQuest 32K ROM Package	**£29**
QUEST MAT	**£3**
Part-exchange your old Mouse for a New QUEST MOUSE for only	**£23**
GXR ROM for BBC Micro	**£22**

N.B.
1. Quest Paint supplied complete with Software in a 32K ROM, Comprehepsive User Guide and a Utility Disc.
2. Quest Font Disc has 22 text FONTS for use within Quest Mouse.

MARK II LIGHT PEN



Our Mark II Light Pen is the very latest in light pen technology. It is totally insensitive to local lighting conditions and works with many different monitors. The pen only responds to the High Frequency light produced by your monitor/TV. An LED indicates when valid video data is being produced. A conveniently located switch is also fitted.

Price Only £21
(Price includes FREE software Disc and Operating Manual)

RB2 Marconi Tracker Ball

RB2 (AMX/Quest compatible)	£52
RB2 including Quest Paint	£78

FLEET STREET EDITOR

Software pack for BBC Micro	£33
Software pack for the Master	£39
Software Pack for Compact	£40
Admin Xtra Disc Utility	£13
Walt Disney Disc Utility	£13
Fonts N Graphics Disc Utility	£13

THE NEW Mk III AMX MOUSE

ONLY: £59 Inc. Super Art package
(carr £1.50)
(Please specify for BBC, Master or Compact)

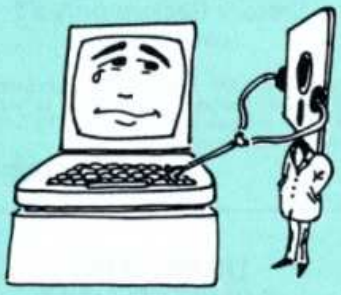
FREE our popular Colour Art software pack worth £15 with every AMX Mouse package purchased from us.

MOUSE MAT	£3
AMX MOUSE ONLY	£29
AMX UTILITY Package	£11
AMX SUPERART Package	£34
AMX STOP PRESS – A Desktop publising software. Works with Keyboard, Joystick or a mouse	£32

We are giving away absolutely FREE, our PAGE-FONT disc with every purchase of STOP PRESS from us.

PAGE-FONTS – Over 20 Fonts for use with AMX Pagemaker	£12
AMX DESIGN (ROM)	£55
AMX 3D ZICON Disc	£19
AMX XAM Educational	£15
AMX EXTRA EXTRA	£16
AMX MAX A gem of desktop (ROM)	£15

DIAGNOSTICS DISC



The BBC Micro is a very complex machine and thus diagnosing a fault can be very difficult. At Watford Electronics, we realise how difficult it can be when faced with a problem, finding yourself a long way from your nearest dealer, or even just uncertain about your Beeb's health, but not wanting to waste time and money taking it to be looked at.
The solution to these problems is here now, in the form of the Watford's Diagnostics Disc. This excellent utility is specially designed to test out the following areas of your Beeb:
RAMs, ROMs, ULAs, Sound, Keyboard, Disc, RS423, ADC, User Port, Printer Port, Cassette, Joysticks, Speech, Disc Drives, 6502 and Z80 2nd Processors.
This utility is an invaluable aid for all those who take the reliability of their system seriously. A comprehensive manual provides full operating details and a list of possible causes and remedies for any faults that you may find along the way. The package also enables a permanent equipment and service record to be maintained.

Only £20.00

BEEB VIDEO DIGITISER

Using any source of composite video (colour or monochrome) and the Watford Beeb Video Digitiser, you can convert an image from your camera into a graphics screen on the BBC Micro.

This uses the full graphics capacity of the BBC micro in modes 0, 1 or 2. The video source may be a camera, video recorder or television, and is connected via the video output socket.

Images produced can be compressed, stored to disc, printed on an Epson compatible printer, directly used to generate graphics, analysed for scientific and educational use or converted to other formats e.g. Slow Scan TV or receiving a picture from a remote camera using a modem.

The output from the digitiser exactly matches the graphics capability in each mode, with up to 8 levels of grey in mode 2. The unit connects into the User Port and automatically scans a complete picture in 1.6 seconds.

Both the black and white levels can be adjusted manually for the optimum picture, or switched to automatic for unattended use. The image produced can be reversed if necessary.

Full controlling software is supplied on a normal sideways ROM and this is easily accessed via additional * commands. The package i designed to allow easy input of complex screens and give full access of the data to the user. Once on the screen, the image can be used as a normal graphics screen, allowing any of the usual graphics commands in BASIC or other ROMs to work on it.

A special print dump routine is included with the driver programs. This is specially designed to produce a fast, correctly proportioned picture, with reduced "contouring", resulting in an accurate reproduction of the original image.

Detailed examples of driving this unit from BASIC or other languages are all provided in the extensive manual supplied.

£109 (Carr. £3)

(Price includes) Digitiser Unit, Software in ROM & a Comprehensive Manual)
(BBC B+ and Master compatible, except Master with Econet)

Magazine Maker

(As seen on TV)
A combination of the Pagemaker and Watford's Beeb Video Digitiser.

Using any video that provides a composite signal and the digitiser, images from a camera or TV can be converted into a graphics screen on the BBC Micro.

They can then be used within Pagemaker to illustrate magazines or newsletters – in fact anything that needs to be created on A4 size paper.

With Pagemaker's many features, a variety of pictures can be composed – the only limit being the imagination.

Pictures can be doctored using Pagemaker's graphics option to produce any number of effects.

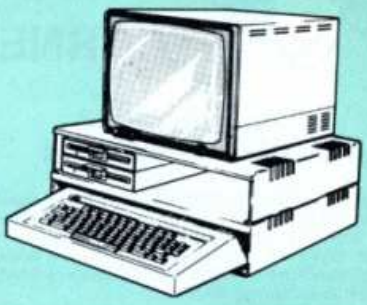
Text can be formatted around the digitised photo on screen using the facilities available, which include 16 typefaces, character and pattern definer, text formatting and the ability to load in wordwise and viewfiles plus much more.

Once created the picture can be printed out.

The Magazine Maker is suitable for any use that requires illustrated documents.

Complete Package **£135.00** (carr. £3)

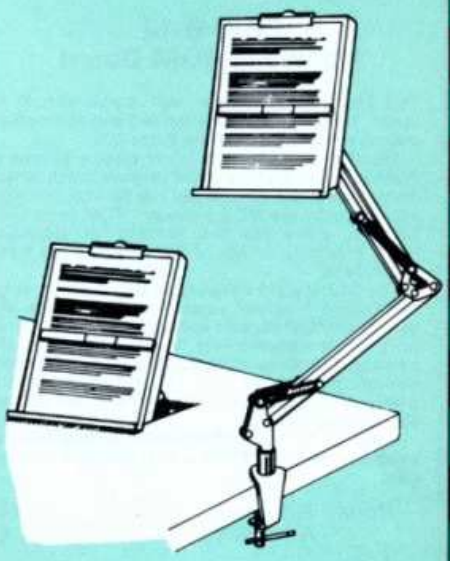
PLINTHS FOR BBC MICRO, MASTER & PRINTERS



Protect your computer from the weight and heat of your monitor. The BBC micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and monitor, whilst the double height version provides enough room for our stacked or side-by-side dual disc drives or TORCH Disc pack, to be placed in the centre section. If you use our stacked drives, the remaining space can be used for further peripherals e.g. Speech Synthesizer, EPROM programmer or simply stationery. The computer slides neatly in to the lower section allowing easy access to remove the lid. The printer plinth is equally sturdy but without the cooling slots. It allows for access to the paper from the front as well as from the rear, (a facility not often thought of in similar products) if the paper is located beneath the plinth. This is a very convenient way to work especially if your work area is not deep enough to take the printer and paper separately.

SINGLE BBC PLINTH	**£11** (carr. £1.50)
DOUBLE BBC PLINTH	**£19** (carr. £3.00)
PRINTER PLINTH	**£10** (carr. £1.50)
SINGLE MASTER PLINTH	**£14** (carr £1.50)
DOUBLE MASTER PLINTH	**£24** (carr £3.00)

COPY HOLDERS



How often have you been about to type hand written notes into your computer when you find that there's nowhere to rest the paper or that your notes are resting at the wrong angle to read the type? Whether the notes be your latest program or the draft of a new trilogy, the new Manuscript Holders from Watford are superb for holding your paper at the ideal height and angle to allow you read and type in ease and comfort.
Available in 2 versions, desk resting and shelf clamping versions, these two units hold your paper firmly by means of a plastic retaining ruler and a clip grip. Both units are full A4 size.

Amazing value at only
Desk Top **£10** (carr. £2)
Angle poise **£14** (carr. £3)

Continued

ARIES CORNER

The Aries B-32 Shadow RAM Card

Like the BBC B+, the B32 provides 20k of shadow screen RAM and 12k of sideways RAM. Unlike the B+, the B32 has simple software commands which allow the user to reconfigure the RAM as 16k of shadow RAM and 16k of sideways RAM, or all 32k as sideways RAM.

With the B32, the programmer gets up to 28k of RAM available for Basic, Logo, Comal, Forth, Lisp and BCPL programs in any screen mode. The business user gets extra memory for View, ViewSheet, Wordwise Plus, Interword and many other applications. For advanced applications, the scientific user gets access to a massive 47k of data storage using the Acorn approved *FX call.

Sideways RAM enables you to load sideways ROM images from disc, allowing you to have a large library of sideways ROMs (subject to the copyright holder's permission) stored on disc. The B32's sideways RAM can also be used to extend any operating system buffer (such as the printer buffer) or to load tape programs into a disc system.

The B32 simply plugs into the 6502 processor socket on your BBC micro – no flying leads to connect and no soldering. Provision of the on-board ROM socket means that the Aries-B32 control ROM does not use up one of your existing ROM sockets.

- Recommended by Computer Concepts for use with their Inter series of ROMs.

Price: **£80** (carr. £2)

CREDIT CARD 24 HOUR
Ansaphone Hot Lines
(0923) 50234 or 33383

Aries B-12 Sideways ROM Board

This board is extremely well made, simple to install, reliable when fully loaded and compatible with the Aries-B20 and the Aries-B32

The B12 provides a total of twelve sideways ROM sockets (the four in the original machine are replaced by the twelve on the board), all fully accessible by the MOS sideways ROM system. In addition, there are two sockets for sideways RAM, giving up to 16k of RAM using 6264 static RAM chips.

The B12 system consists of two parts: a large detachable "mother board" which carries the extension ROM sockets and a small "base board" on a short ribbon cable, which plugs into the existing sideways ROM sockets. This two-board design eliminates the reliability problems previously associated with some other ribbon-cable based systems.

If you do not have a B32 or B20, a small adaptor module (the Aries-B12C) is available at a nominal cost.

Price: Aries B-12 **£40**
Aries B-12C **£5**

ARIES B-488 IEEE-488 INTERFACE UNIT

The Aries-B488 is an interface unit to enable the BBC micro to control and monitor IEEE-488 bus systems. The IEEE-488 bus (also known as the 'GPIB' or 'HP-IB') is the standard method of interconnecting programmable laboratory instruments and control equipment. Using the B488, up to 15 devices may be connected in a single high-speed data network.

£238 (Carr £3)

All prices in this advert are exclusive of VAT.

SIDEWAYS ZIF SOCKET

Allows you to change your ROMs quickly and efficiently, without opening the lid. The ZERO INSERTION FORCE (ZIF) socket is located into the ROM Cartridge's position.

- Very simple to install. NO SOLDERING required. The ZIF (Zero Insertion Force) eliminates the possibility of damage to your ROM pins when inserting & extracting!
- The low profile of the socket allows unrestricted access to the Keyboard.
- All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.
- This versatile hardware solves the problem of running out of socket space. Simply lift the ROM from the ZIF & insert a different one (No pulling or pushing of Cartridges. It is a must for all professionals and Hobbyists alike.)
- BBC, B+ and Master compatible.

ONLY **£16** (carr £2)

Low Profile CARTRIDGE SYSTEM

Complete System consists of: Low profile ROM Cartridge, Socket housing, Cable assembly, 5 labels and a library storage rack for the BBC B.

- Complete System **£11**
- Spare Cartridges **£2.50**
- Spare Rack **£1.50**

ROM Cartridges for the BBC Master
Twin **£7.50**; Quad **£11**

16K Sideways RAM Modules

Complete with such features as read and write protection, these new modules from Watford Electronics are ideal for the hobbyist, software developer and ROM collector.
Key points to note about this new addition to the Watford range of products are:

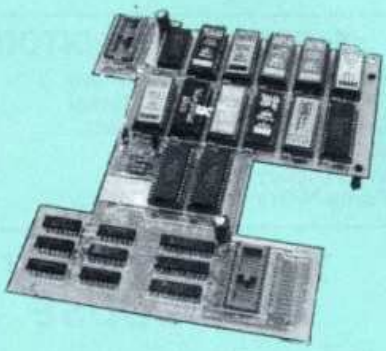
- Write protection (useful in a variety of circumstances).
- Read protection (allows recovery from ROM crashes).
- Compact construction.
- May be fitted in systems even with a ROM board.
- Multiple units may be fitted, even with a ROM board.
- No overheating or overloading problems.
- Free utilities disc supplied.
- Can be used as a 16K PRINTER BUFFER.
- Ideal for professional software development.
- Supplied with utilities software disc.

Only: **£29** (carr £2)

Optional extras

READ and WRITE protect Switches **£2** each
Battery for Battery Backup **£3**

SOLDERLESS SIDEWAYS ROM SOCKET BOARD



In the May 1986 Micro User's independent review, the writer concludes, "The board has been well laid out. Its position is much better than others – not over the HOT RAM chips and further away from the disc controller area". "I give the solderless ROM board the thumbs up and wish it success".

This brand new board from Watford Electronics is designed specifically for those wishing to add a ROM board to their own BBC without the need to perform any soldering.

This new board expands the total possible number of ROMs in a BBC from 4 to 16.

Unlike our competitors inferior boards, the ONLY upgrade required for fitting battery backup to the Watford Solderless ROM board (all Watford ROM boards, actually) is the fitting of the battery itself. (No other expensive components are required.)

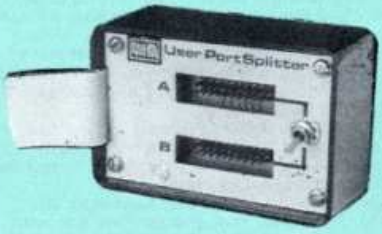
- The key features of this new, no fuss, easy to install quality product from BBC leaders Watford Electronics are as follows:
- Increase your BBCs capacity for ROMs from 4 to 16.
- **No soldering required.**
- Very low power consumption.
- Minimal space required.
- Compatible with Torch, DDFS, RAM Card, 2nd Processor, etc.
- Socket 14 takes two 6264 RAM chips.
- Read protect to make RAM "Vanish") allows recovery from ROM crashes.
- Battery backup option for RAM chips.
- Supplied ready to fit with comprehensive instructions.

Price: Only £32
Battery backup fitted **£36**
Battery Backup only **£3**
(carriage £2)

- Sideways RAM Utilities Disc for Solderless ROM Board. Includes the options to load and save ROM Images and the facility to use Sideways RAM as Printer Buffer.

Only: £8

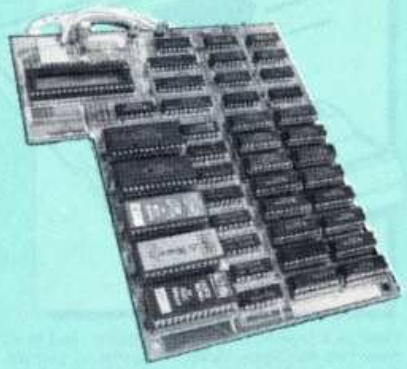
USER PORT SPLITTER UNIT



Gone are the days when you had to plug and unplug devices from the User Port. This extremely useful little device allows two units to be connected to the User Port simultaniously, and select between them simply by toggling a switch. This device is particularly useful for those people using Quest Mouse and the Watford Video Digitiser or any similar combination.

Excellent Value at **£22** (carr £2)

ROM/RAM CARD



Watford Electronics announced the first ever commercial ROM board for the BBC micro, the Watford Electronics 13 ROM Socket Board 3 years ago. Following the success of this board, we have designed what probably represents the ultimate in expansion boards, the new Watford Electronics ROM/RAM board. This highly versatile and sophisticated board represents the latest in "2nd generation" sideways ROM technology for the BBC micro, designed to satisfy the serious BBC user.

- NO SOLDERING required to fit the board.
- NO overheating problems.
- No User Port corruption (avoids problems with the mouse, modems, Eprom Programmers, etc.)
- Fully buffered for peace of mind.
- Firm mounting in BBC micro.
- Compatible with all BBC micros (not BBC+ or Master).
- Total number of ROMs increased from 4 to 8.
- Up to 8 banks of sideways RAM (dynamic).
- Option for 16k of Battery backed CMOS RAM (CMOS RAM needs one ROM socket).
- Software Write protect for ALL RAM.
- Read protect for CMOS RAM (ALLEVIATES crashes during ROM development).
- Separate RAM write register (&FF30 to &FF3F).
- Automatic write to currently selected RAM socket for convenience.
- Accepts any ROM.
- FREE utilities disc packed with software.
- Compatible with our DDFS board, 32k RAM Card, Delta Card, sideways ZIF, etc.
- Large printer buffer.
- UNIQUE Fully implemented RAM FILING SYSTEM (similar to the popular Watford DFS).
- ROM to RAM load and save facilities.

The SFS (Silicon Filing System) can utilise up to the full 128k of RAM (with the SFS in any paged RAM) as a SILICON DISC. This behaves as a disc drive, with all the normal Watford DFS features (including OSWORD &7F for ROM-SPELL, etc.) to provide an environment that looks like a disc but loads and saves MUCH faster.

The ROM-RAM Board plugs into the 6502 CPU socket. This leaves free all the existing ROM sockets, which can still be used normally.

Any ROM that can be plugged into the BBC micro's own ROM sockets may be used in the ROM-RAM Board.

The ROM-RAM Board is supplied with all ordered options fitted as standard. Upgrade kits (with full instructions) are available for all of the options, for later:

Please write in for further details.

INTRODUCTORY PRICES:

- ROM/RAM card with 32k dynamic RAM ***£45***
- ROM/RAM card with 64k dynamic RAM ***£59***
- ROM/RAM card with a massive 128k dynamic RAM **£89**

(carriage on ROM-RAM Card £3)

OPTIONAL EXTRAS:

- 16k plug-in Static RAM kit **£16**
- 16k Dynamic RAM for Upgrade **£16**
- Battery backup **£3**
- Read and Write protect switches ..... **£2** each

Complete ROM-RAM board
All options installed **£115**

P.S.
Is your existing ROM Board overflowing with ROMs? Do you need more Sideways RAM? Is your Board unreliable? Then upgrade to Watford ROM/RAM Board and pay £5 less

Le Modem

The MODEM from Watford

At last a professional MODEM for the BBC Micro. Unlike other 'Modem packages' this is a complete package there are no extra software costs to get 'up and running'. Of course Le MODEM is multi-standard, i.e. 300/300, 1200/75 & 75/1200 UK and BELL (USA) are all supported.

The features that make Le MODEM such good value are:

- *A complete communications terminal that transforms your BBC Micro into a very powerful World-wide data transfer system.*
- *Auto Dials, Auto answers, and is completely controlled by your micro. There are no external controls!*
- *Allows you to access PRESTEL, B.T. GOLD, THE SOURCE, MICROLINK, MICRONET, MICROWEB, THE TIMES NETWORK, MICRO LIVE (BBC TV database), CITY BB and more.*
- *Designed to be SIMPLE but SOPHISTICATED. To LOGON to a data base all you have to know is its TELEPHONE NUMBER, Le MODEM does the rest.*
- *Supplied with a comprehensive telecomms package in a 16K sideways ROM which includes a FULL PRESTEL terminal allowing TELE-SOFTWARE to be downloaded.*
- *A comprehensive 80 column terminal. This includes XMODEM error checked transfer protocol, to allow error free data transfer anywhere in the world!*
- *FULLY controlled by simple '*COMMANDS' allowing you to control it from your own BASIC programs. To get you started we supply a FREE disc of bundled software!*
- *Connects to the 1MHz bus. A *AUDIO ON-OFF command allows you to actually hear the telephone line through your BBC micro loudspeaker.*
- *Completely self contained with internal mains power supply. (Even a free mains plug is fitted!) A *TEST facility gives ON SCREEN indication that Le MODEM is working correctly.*
- *Packaged in such as way that you need nothing else except a BBC Micro to communicate with computers all over the world.*
- ***FREE Registration to MicroLink.***

SPECIAL OFFER

Price: ***£82***
(carr £3)

(Price includes, Le Modem, Software ROM, Cables & Comprehensive Manual)
(Write in for further details)

REPLICA 3

This new improved REPLICA 3 from Clares is a very powerful disc based TAPE to DISC Utility. It now transfers even more programs than ever before. Replica 3 will not work with all programs but then neither will anything else. 30,000 Replicas have been sold to date. It has to be good.

£15 (40 or 80 track)

Acorn's Speech Synthesiser package, complete
Special Offer £18

APOLLO

The NEW Modem from Watford

Following numerous requests from you, our discerning customers for an APPROVED, Low Cost & High Performance modem with Auto Dial & Auto Answer facilities as standard) we bring you the versatile APOLLO Modem. Just compare the features and look at the price (which incidentally includes the cost of the Software, manual and BBC connecting cable). We are sure you will agree that Watford Electronics in their traditional way are giving you a super 'value for money' deal.

Just look at these features:

- V21 for Bulletin boards, Microlink, Telecom Gold, etc.
- V23 for Prestel, Home Banking, and other Viewdata services.
- Reverse V23 allows User run Viewdata service.
- 1200-1200 half duplex for communications.
- XMODEM, HEX and ASCII file transmission.
- Auto Dial of given 'phone number.
- Auto Answer for User's Bulletin Board.
- 80 column terminal with split screen facility.
- Prestel text screen dump.
- Fully BABT approved.
- **FREE Registration to MicroLink.**

The Apollo is attractively finished in matt black. It opens the doors to world communication to both, the Hobbyist and the Professionals alike. With baud rates varying from 300/300 Originate and Answer, 1200/75 and 75/1200 full duplex and 1200/1200 half duplex, virtually all the popular tele-services can be accessed. A comprehensive Comms ROM oversees the use of the APOLLO, providing simple commands for all the software controlled facilities. APOLLO is an ideal modem for both the first time buyer and the seasoned user. Join the Telecommunications Revolution – Buy a Watford APOLLO!

Only: **£82** **(Carr £3)**

Price includes, the Modem, Comm Software Cables & Operating Manual).
(Write in for full specification)

VOLTMACE JOYSTICKS

Delta 3B Single Joystick	£12
Delta 3B Twin Joysticks	£17
Delta 3C Joystick for Compact	£10
Delta 14B Single Joystick	£12
Delta 14B/1 Adaptor Module	£12
Transfer Software Disc-Tape	£7

ATTACHE CARRYING CASE

For the BBC Micro. Attractively finished in antique brown leatherette. Lockable.

Only **£10** (£2 carr.)

Versatile BEEB SPEECH SYNTHESISER Unit

The Watford Speech Synthesiser is a very flexible speech synthesis unit based upon the powerful phonemes system. This system stores the building blocks of speech (called phonemes) and allows you to combine them quickly and easily to form virtually any word imaginable.

Supplied with an advanced ROM, you are provided with a 500 word dictionary to get you started. These can easily be added to by following the notes given in the comprehensive manual.

SPECIAL PRICE £32 (carr £2)

Continued

COMPUTER CONCEPT'S ROMS

ACCELERATOR	£46
CARETAKER Basic Utility	£23
DISC DOCTOR	£28
Graphics ROM	£29
TERMI	£25
COMMUNICATOR	£49
SPEECH ROM	£24
Printmaster	£25

Wordwise £23

Wordwise plus £40

We are giving away absolutely **FREE**, the superb Word-Aid ROM worth £24, with every WORDWISE PLUS package bought from us.

Word-Aid

The most comprehensive utilities ROM for Wordwise-Plus

Extend the power of your Wordwise Plus word processor with this most advanced ROM from Watford. By utilising the powerful Wordwise Plus programming language, WordAid provides a whole host of extra features, all accessed via a special new menu option. This ROM has been personally approved by Mr Charles Moir, the author of WORDWISE PLUS.

- Alphabetical sorting of names and addresses.
- Text transfer options.
- Chapter marker.
- Epson printer codes function key option.
- Search and display in preview mode.
- Embedded command removal.
- Print Multiple copies of a document.
- Multiple file options for print and preview.
- Address finder.
- Label printer.
- Mail-merger.
- Number/delete/renumber.
- Clear text-segment area.
- BBC B, B+ and Master compatible.

Only **£24**

(N.B. Word Aid requires a Disc Interface in your Micro)

HI-WORDWISE-PLUS DISC: £5

SPELL MASTER £42

Inter SHEET ONLY £37

CHART ONLY: £25

Inter-WORD £36

MEGA-3 ROM

Interword, Intersheet & Interchart – 3 in one ROM **£76**

INTERBASE £49

All Prices Exclusive of VAT

VIEW

VIEW WORDPROCESSOR 2.1	£35
VIEW 3.0 ROM	**£48**
VIEW PROFESSIONAL	**£65**
HI-VIEW (for use with 6502 2nd Processor)	£36
VIEWSHEET (Acornsoft)	£36
VIEWSTORE	£36
VIEWSPELL with 80 track disc	£29
VIEWPLOT Disc (Please specify for Master 128 or Compact)	£20
VIEW-INDEX	£12
OVERVIEW Packs 1 & 2 for the Master	£72

Watford's own Sophisticated VIEW PRINTER DRIVERS

Epson FX80 & Kaga KP (Disc)	£8
Juki & Brother HR15 (Disc)	£8
Silver Reed Printers (Disc)	£8

MINI OFFICE II

DISC Version for BBC B & B+	£14.00
DISC Version for BBC Master	£16.50
ROM Version	£43.00

(When ordering please specify for which Micro & 40 or 80 track Disc).

Harness the full potential of your Epson RX or FX printer. The NLQ ROM makes Epson printers produce Near Letter Quality output with optional proportional spacing, enlarged and underlined. Accessed by simple * commands from Basic, Wordwise and View (with driver) or almost any other language.

(Send an SAE for sample printout)

Only: £25

VIEW PRINTER DRIVER for NLQ ROM £7

VIEW PRINTER DRIVER ROM

View is a powerful word processor, but until now has seriously lacked in terms of printer support. With the launch of our Printer Driver ROM, which includes an extremely powerful and easy to use Printer Driver Generator, View users can find themselves in the realms of advanced word processing only at a small outlay.

The VPD extends View's printer command with a series of mnemonic commands. All standard highlight sequences are also supported. A large range of printers are supported by drivers contained within the ROM (the drivers can be downloaded and customised). Printers supported include: Epson's MX, RX, FX, FX, LX, JX80 range, HI80, KP810/910, PW1080, JP101, HR15, M1009, GLP, Panasonic KX-P1081/2, JUKI 6100, etc.

Other printers are readily supported by defining a Printer Driver using the built in Printer Driver Generator. The features mentioned below are available to both the built in Printer Drivers and user defined drivers (assuming the printer supports the features).

NLQ control, Underline, Bold, Proportional Spacing, Microspacing, Italic, Superscript, Subscript, Condensed, Enlarged, Double Strike, Set lines per inch numerically (e.g. LPI 6), Set characters per inch numerically (e.g. CPI 5), Select printer font, Select printer ribbon colour, Translation sequences, Emulation of BBC Character Set, Simple numeric expressions for certain operations, Full printer setup, Send control codes, Print prompt on screen, Redefinable Pad character, Pause for key press, Prompt to change daisywheel, and Execute * command when printing.

Other features include a very powerful on screen preview, with bold, italic, underline, super/subscript, enlarged highlights, and a special printer driver to allow memory based text to be previewed by View 1.4. Of course, View 1.4, 2.1 and 3.0 are all supported, as is Shadow RAM and 6502 Second Processors. The BBC B series and Master series of micros are supported. A comprehensive manual is supplied. All in all, a very professional product for the discerning user who wants power at their finger tips. (Write in for a detailed leaflet).

Price: Only £33

ROM-SPELL

Probably the most advanced and fastest spelling checker available for the BBC Micro. Compatible with View, Wordwise and Wordwise Plus ROMSPELL is simple to use with easy editing of incorrect words. Full facilities for editing the user dictionary to allow customisation to your personal needs. Dictionary includes over 30,000 words and is supplied with a Comprehensive manual.

NOT compatible with 1770 DFS.
(Please state 40 or 80 track disc)

Price still only: £25

DUMPOUT 3

A highly sophisticated screen dump ROM. This has to be the most flexible and powerful screen dump ROM yet produced for the BBC micro. It will put on paper anything you see on the screen, including full Mode 7 graphics.
Also provided are window setting utilities and OSWORD calls to plot and read Mode 7 graphics pixels.

Facilities:

- Vertical and horizontal scaling in all graphics modes and mode 7
- Rotation of image by 90, 180 or 270 degrees
- Left hand margin setting
- Screen dump window setting
- Colours appear as grey scale
- Two tone fast dump
- Colour mask
- Mode 7 contrast expansion
- Mode 7 contiguous dump
- Key triggered and User Port triggered dumps

The Micro User Feb. 1985.
'Without reservation I wholeheartedly recommend the Dump Out 3 ROM as the ultimate screen dump facility for the BBC Micro . . . it must represent excellent value for money and surely cannot be beaten".

For use with the following printers:

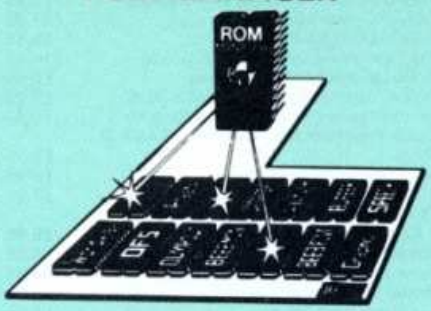
GLP, GP80/100/250, CANNON, STAR, KAGA/TAXAN, NEC, SHINWA CP80, GEMINI, EPSON MX/RX/FX, M1009, NEC PC8023, DMP100/200/400, Panasonic KX1081/82, Mannesman Tally and compatibles.

Only: £25

BBC SOFTWARE'S Popular Educational Software

- Maths with a Story 1 (Disc). 4 primary level maths programs **£11.25**
- Maths with a Story 2 (Disc) 4 further maths programs **£11.25**
- Picture Craft (Disc) 6 - 14 age group. Pack consists of flexible geometrical design & colouring programs **£17**
- WAVES: Science Topics (Disc) CSC O Level Physics program. **£14.95**
- RELATIONSHIP: Science (Disc) O Level Biology program. **£20.00**
- BONDING: Science (Disc) O Level Chemistry program. **£20.00**
- ELECTROMAGNETIC SPECTRUM (8 Discs) O Level program. **£20.00**
- ELECTRONICS IN ACTION (Disc) O Level program **£19.95**
- NEWTON & THE SPACE SHUTTLE (Disc) O Level program. **£20**
- ECOLOGY (Disc) O Level program. **£20**
- POLYMERS (Disc) O Level program. **£20**
- Clasification & Periodic Table O Level. The suite is supplied with its own database of chemical elements which can be classified according to your own rule. **£20**
- FOOD & POPULATION (Disc) O Level program. **£20**
- MICROTECHNOLOGY (Cassette) O Level program. **£11.25**
- A VOUS LA FRANCE (2 Cassettes) A French language home study aid. **£21.70**
- DEUTSCH DIREKT! (Disc & Audio Cassette) **£19.95**
- Modem Master (Disc) **£11.25**
- ADVANCED TELETEXT SYSTEM **£8.65**
- PERIOD TABLE SOFTWARE **£20**
- Astronomy – Primary (Disc) **£12**
- Computers at Work – Primary **£17.35**
- Introducing Geography – Primary **£17**
- **Introducing Geography 11-17yrs** **£17.50**
- Electric Fields 6-14 years **£11.25**
- BlackQueen Contract Bridge **£13**
- Espana Viva – 3 Discs **£19.95**
- A Vous La France Disc **£21.50**

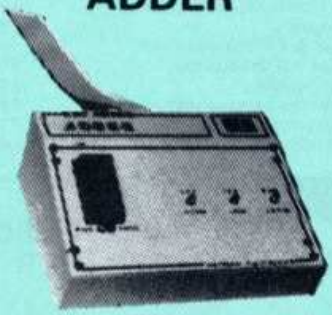
ROM MANAGER



Take control of your Sideways ROMs with ROM Manager. This powerful utility ROM gives you power over your sideways ROMs. Disable whole ROMs, send commands directly to named ROMs and many other powerful facilities.
"Provides comprehensive management of all your installed ROMs". (BEEBUG November '84.)

ONLY £20

ADDER



The only low cost EPROM Programmer for the BBC Micro that will program both the standard 21V and the new 12V5, 27128 EPROMS.
Adder is the ultimate EPROM programmer for the BBC Micro. It will program many different EPROMs up to the very latest 27256 32K devices.
The Adder unit connects to the User Port and draws its power from there too. The EPROM is mounted in a top quality ZIF socket. There are no switches or controls as Adder is entirely software controlled.
The Adder software provides sophisticated facilities for programming EPROMs from a RAM image produced by loading disc files. The software is menu driven and designed for ease of use.
Features:

- Two ultra fast programming algorithms or standard slow algorithm.
- Supports standard 21V programming and newer 12.5 volt EPROMs. (Software switched).
- The RAM image to be programmed can be built up in many ways. Sections of image can be loaded separately. Part programming. Read EPROM. Edit data in memory.
- Automatic processing to handle a list of files to program into the EPROM.
- Automatic disc buffering to allow programming of 32K 27256 devices from a 32K file without extra effort.
- Verification gives detailed error list and checksums are maintained. There is also a blank check facility.
- Works with all standard filing systems. Generates header code for RFS ROMs to allow Basic programs etc. to be stored in EPROM. More than one file per ROM permitted.
- Programs the following EPROMs:
From 2K to 32K: 2516, 2716, 2532, 2732, 2764, 2764A, 27128, 27128A, 27256 (Both 12.5V and 21V).

£75 (£3 Carr)

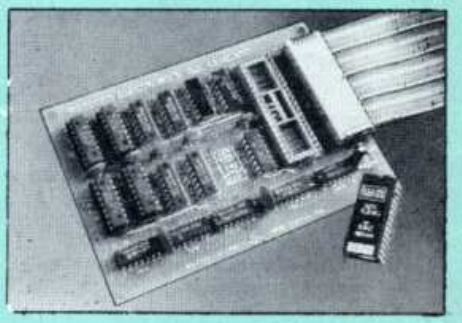
TEX EPROM ERASERS

EPROMs need careful treatment if they are to survive their expected lifetime. Over erasure of EPROMs very rapidly turns them into ROMs!
The TEX erasers operate following the manufacturers specifications to give the maximum possible working life by not erasing too fast. We use these erasers for all our own erasing work.

- **ERASER EB** – Standard version erases up to 16 chips. **£28** (carr £2)
- **ERASER GT** – Deluxe version erases up to 18 chips. Has automatic safety cut-off to switch off the UV lamp when opened. **£30** (carr £2)
- Spare UV tubes. **£9**

32K

SHADOW RAM- Printer Buffer Expansion Board



A MUST FOR WORD PROCESSING

Watford Electronics now brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. Don't throw away your BBC B for a BBC B Plus or BBC Master. Just plug the ribbon cable into the 6502 processor socket, and fit the compact board inside the computer. Immediately you will gain not 16K or even 20K, but a massive 32K of extra RAM!!!

- IMPROVE your WORD PROCESSING system, whether disc or cassette based. Don't wait for a slow printer – type in text while printing. TWO JOBS DONE SIMULTANEOUSLY and £100+ saved on a printer buffer.
- "VIEW" Wordprocessor users can now type in letters in 80 columns and have up to 28,000 bytes free – 5 times as much as normal.
- In WORDWISE (or WORDWISE-PLUS), preview in 80 columns with the full 24K of text in memory. This product is recommended as an ideal complement by Computer Concepts.
- Combine GOOD GRAPHICS and LONG PROGRAMS. Use the top 20K of the expansion RAM as the screen display memory, leaving all the standard BBC RAM free for programs. Benefit from MODE 0/1/2 graphics and 28K of program space.
- Use the FULL 32K or the bottom 12K of the expansion RAM as a PRINTER buffer for PARALLEL or SERIAL printers, sound channels, RS423 etc. Print large text files while running long graphics programs, and have all your buffer options available as well (*FX15,21,138,145,ADVAL etc). Please note only a 12K printer buffer can be used with Wordwise or Wordwise-Plus, due to the way they are written.
- Unique facility to turn ROMs off and on again. Unlike all other ROM managers, this feature does not use 'unofficial' memory. Two bytes of normally user-inaccessible memory on the RAM card are used to ensure ROMs are disabled WHERE OTHER ROMS FAIL.
- Recommended by Computer Concepts for use with their Inter series of ROMs.

Only £59 (carr £2)
(Price includes a comprehensive manual and the ROM)

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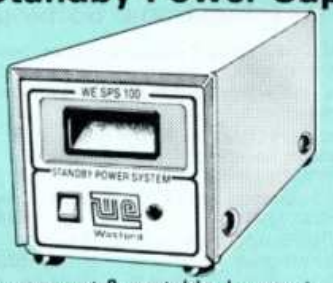

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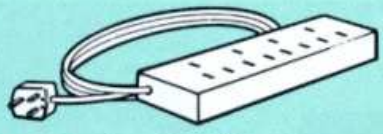

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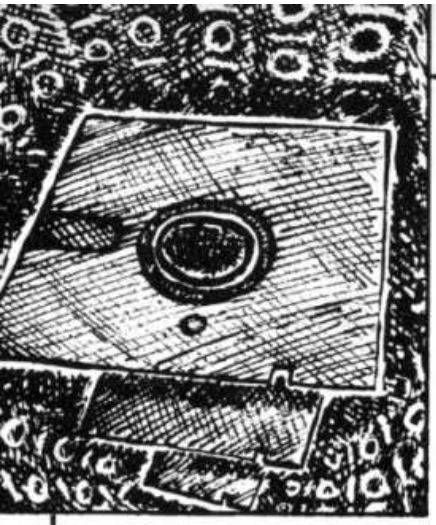


Doing our bit for the race against time – keeping you lot alive!

SPORT AID '88

RUN THE WORLD

J.Walsh and H.Watts

This is a program for all you keen keep fit types; if you ever wanted to keep a record of how well you are doing, then this is for you. I have just started jogging (hey – so have I – Ed) and thought that it might be a good idea to put a record of my progress in a data file, then I thought, why not keep a record of my pulse rates as well? So here is a program to do just that.

The system is split into two programs, the first, called **Timer**, just collects all the data from one run and adds it to the data file on disc, called **Records**. It does this by creating a new file with all the records (including the new one), called **B. Records**, and then replaces the old file by this new one, so if something goes wrong during the file accessing, the original data file should not be lost.

The second program allows you to view the data collected, it is called **View**. It reads all the finish times, and it can read any record required, once completed, it draws a series of graphs and charts from the datafile.

How to use the system

The timer program gives you a 15 second countdown (after telling you to start) before starting the clock, enough time to get out of the house. The last 5 seconds are also pipped, ie, a beep at each second, you might be able to hear these from outside.

Then you start running!

When you get back, press <Space> to stop the timer, it will then start reading your pulse. You can take your pulse over any 5 second multiple (up to 30 seconds) period, use <Space> to change the time period, and just type in the number of pulses in that period and press <Return>.

It will be converted into your pulse per minute, so the longer the time period used the more accurate the pulses will be, but the futher apart they will be. I would suggest using a 20 second period. You can take as many readings as you like. To stop recording, enter a pulse of 999, the variable **max–test** test for this (the maximum number of readings allowed). In the listing, it is set as 100, but by using a period of 10 seconds, this gives a minimum total recording time of over 16 minutes, long enough for most people to recover!

It would be a good idea to have a practice at entering your pulses, one hint is to use the pips of the clock for timing the readings.

Once completed, the program will then ask for the distance you ran, you can enter this in any measure of miles, kilometers or meters, so you must also enter the units used, ie, M, Km or m respectively – for example 26 miles would be 26M, 100 meters would be 100m.

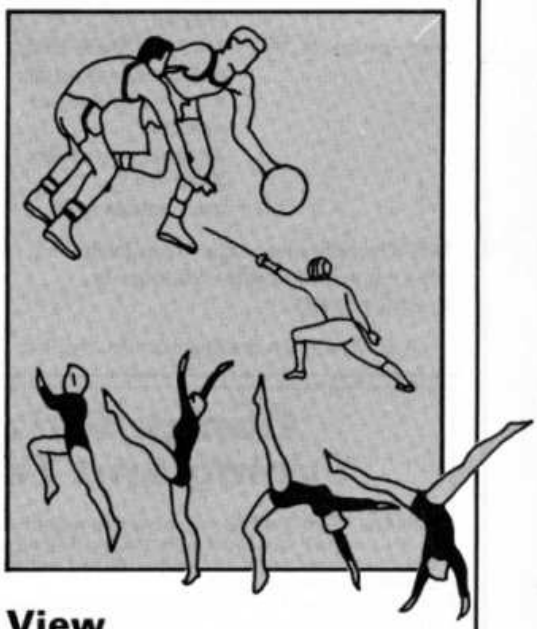
The format of the data file is:

NR – number of records

followed by **NR** records, each record is formatted thus:

FT – finish time in 1/100'th seconds,
DI – distance,
unit$ – units of distance,
DI–scale – distance scale to convert to meters,
NP – number of pulse entries,

followed by NP pulse entries, each of TI–time that pulse was taken at in seconds, PL–pulse rate per minute.



View

There is not much to say about this program, it just shows you the data and draws a few graphs. It is split into 2 sections, the first shows all the run times, whereas in the second part, you are asked for a particular run, and it shows the pulse rates. Asking for record zero takes you back to the first part.

You may wish to add bits to this program so here is a little technical information, this is what the procedures do,

PROCread–times

This sets up all the run data, not the pulses, but all the other info, when it has finished this is what it returns:

NR – number of records (runs),

time(X) – time of run X, time(0) = max time,

DI(X,Y) – Y=0 => distance, Y=1 => distance scale (to meters), of run X, DI(0,0/1) = max distance/ scale,

unit$(X) – units of distance DI(X,0),

speed(X,Y) – average speed,

Y=0 => meters per second,
Y=1 => unit$(X) per minute,
Y=2 => unit$(X) per hour.

Procedures

The procedure **PROCread-record(N)** reads all the data for record number N.

FT – **finish time,**
DI – **distance,**
DI-scale – **scale distance to meters,**
unit$ – **units of distance DI,**
SP1 – **average speed in m/s,**
SP2 – **speed in unit$ per minute,**
SP3 – **speed in unit$ per hour,**
NP – **number of pulse entries,**
test-pulse(X,Y) – **Y=0 => time that pulse was taken at, Y=1 => pulse per minute, X=entry number, X=0 => max values of Y,**

PROCgraph(max-x,x-step,lable-x$, max-y,y-step,lable-y$,loop-x, x-co$,y-co$)

A general graph drawing routine, the first 6 parameters are for the axes, 3 for X and 3 for Y.

max-* – the maximum value for the axis,
***-step** – the step that the axis will be numbered in, if the numbers are too close together then they won't be printed,
label-*$ – the label for the axis, (where * is either **x** or **y**)
loop-x – the value to which the X loop will go to, ie, FOR X = 1 TO loop-x,
x-co$ – string for EVAL of X co-or
y-co$ – string for EVAL of Y co-or,

● Note: If you wanted time on the Y axis, plotted in minutes up to say 10 min's, but the values that are to be plotted are measured in 1/100'th of a second, you have to make sure that the **y-co$** is in the right scale, eg, if **max-y=10** for 10 minutes, then you might have **y-co$="time(X)/100/60"**. Both the scaling from 1/100'th to minutes and the use of 'X' are used for accessing an array.

PROCformat(NP,total-time,time-step)

This procedure is not used, but it might be quite useful to someone, so this is a brief description of what it does, it formats the pulses from the non-uniform time intervals that they were entered in and converts them into pulses at fixed time intervals.

NP – the number of pulses in the source array.
total-time – the length of time you want to have the readings take over, in minutes.
time-step – the time interval at which you want the readings taken, in seconds.

the output is:

max-pulse – the total number of formatted readings,
pulse(X) – the pulse rate at time X*time-step from X=1 to X=max-pulse, X=0 => the max pulse rate.

● I hope you like the programs, but don't kill yourself trying to test them – Remember jogging must be taken very gently to begin with, increasing the distance every couple of days, and if you take a day off, then do a little less than you are used to, just to make sure that the body and the heart are not stressed too much!

Don't be dumb and don't overdo it!

Any individual, school or organisation organising a Sport Aid event this Summer can apply for a *Free* copy of the Run the World software. Send your request to: SPORT AID DISK, A&B COMPUTING, NUMBER 1 GOLDEN SQUARE, LONDON W1R 3AB.

Good luck with your fund raising efforts!

Anyone else interested in the software can buy a copy by filling in the order form in Software Sale this month and returning it to the ordering address given in the advert. Order product number DB94. Price £8.00.

Computerized Typing and Teeline

INSTANT COPY TYPING incorporates a well-tried keyboard tutor. After 3 or 4 hours the student is able to start keying a 46-page easy-to-spell adventure story into the computer. Speed and accuracy scores are given at the end of each exercise.
The advantage of the system is that it encourages the students to keep their eyes on the document being copied. A 'bleep' tells them when they make a mistake. For the rest of the time they can happily ignore the screen. This unique feature helps to build up their confidence and their performance.

INSTANT SHORTHAND is based on the same disk as Instant Copy Typing. The difference lies in the book. In Instant Shorthand the story changes, page by page, into Teeline. The students learn by keying the story into the computer. Their ability to type and transcribe shorthand – including their own outlines – is automatically checked by the machine. Mistakes are notified immediately.
Tested at Cornwall College in Falmouth, it achieved better results in two terms than orthodox teaching methods had previously achieved in three. Interviewed on Radio Cornwall, the students taking part in the validation trials were enthusiastic:–

"It's marvellous because you develop your Teeline and your typing at the same time."

"At the end of each exercise I can find out my speed and accuracy from the computer. It's very encouraging as you see yourself progress."

"Everyone enjoys using the system. It's much more exciting and motivating."

"It's vocationally orientated."

The system is proving ideally suited for open learning. Its simplicity not only encourages the slow learner; it also provides the more able with a boost that gets them away to a flying start.

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SNATCH
Marion

Dave Reeder

At last, some new games! And just when the heat of the Summer drives us into the cool dark of our rooms

Welcome!

Phew! Relief time here in *The Arcade* – at last we have more than one game to talk about. I was nearly reduced to running that map of *Bozo the Brave* that Tynesoft's Dave Croft keeps talking about!

There is evidence too that 1988 is going to be a classic year for Beeb games. I know we've had a couple of lean months, but there are gems out there just waiting for you to save up enough money. Such as? Well, how about Kevin Edwards' *Galaforce 2* (exclusively previewed here)? Or the multi-user madness that is *Bolo* – previewed by your correspondent after braving the computer science labs of Cambridge University. Or even a new *Repton* release – who's counting? Is that number four or five?

There's even evidence that the trickle of Archie games is turning into a dribble – though you'll have to check out A&B's Red Keys pages for details as I don't get paid enough to buy one.

There's an idea for a letter writing campaign. Why not drop a line to Mark Webb today at the editorial address saying (in your own words) "I think you ought to give Dave Reeder an Archie 'cos his column is brill". That should do the trick because, without a freebie, I'm not going to see one for quite a time.

Ah! What a shame! Did I mention that I'm moving house this month? Relocating to St Albans, home of those good people Beebug.

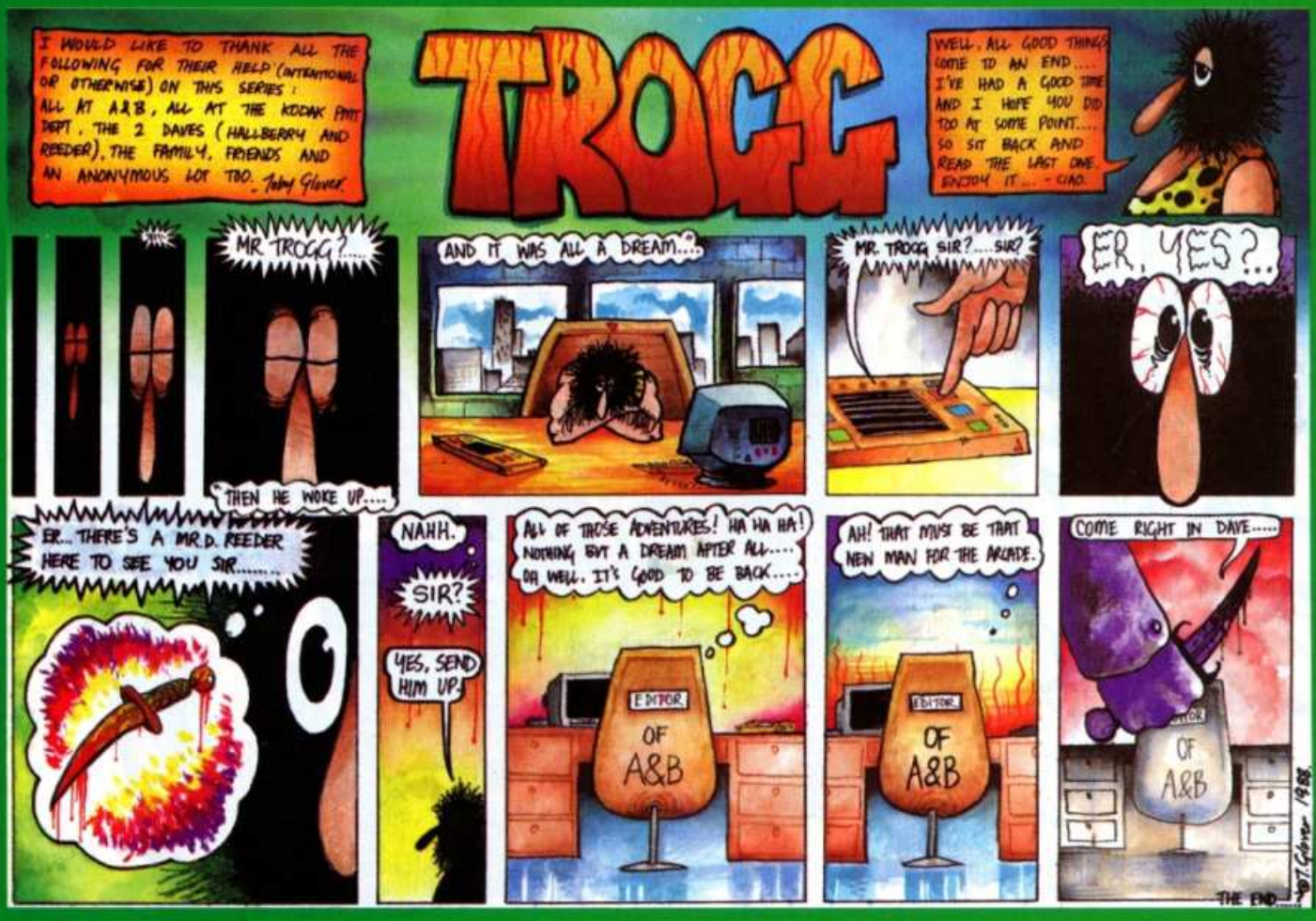
Enough rambling – on with the incisive commentary couched, as always, with coruscating charm and winsome wit. On with the goodies!

Game of the month

Shark
Audiogenic
Model B/Master/Electron
Tape/disc £9.95/£11.95

Graphics/sound 8 Playability 9 Originality 7
Options colour/black/white Value for money 8
Lifespan 7 Overall 8

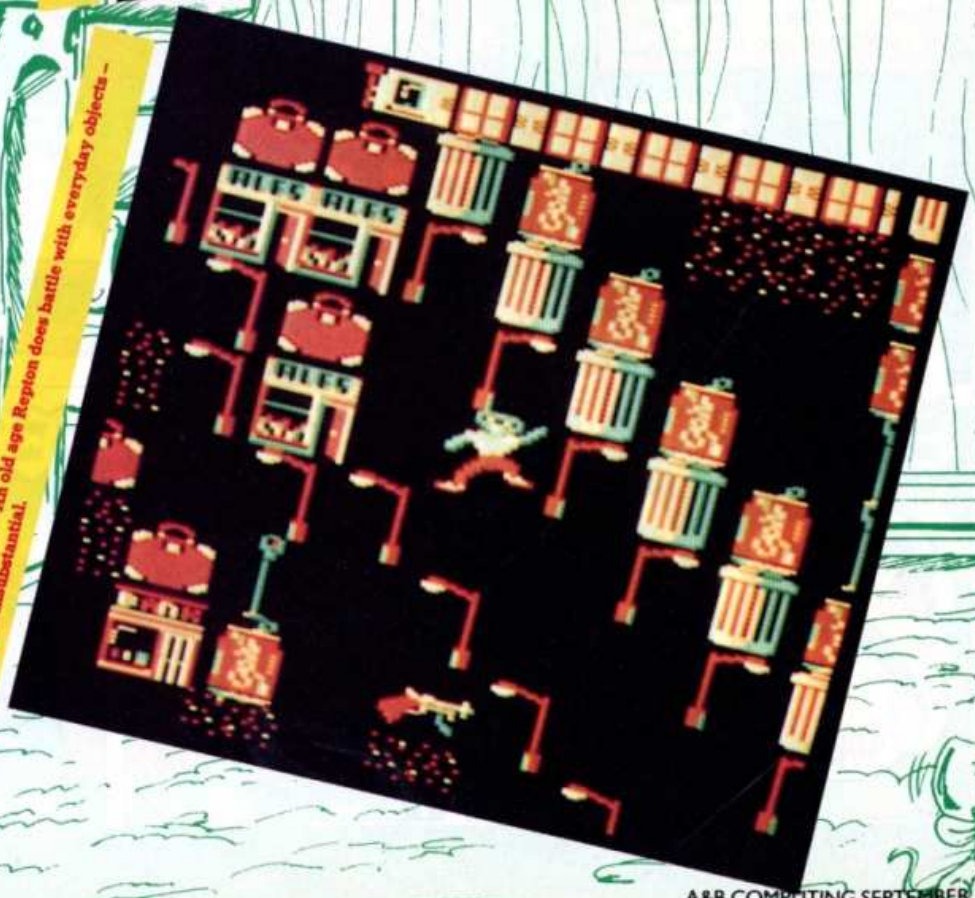
THE ARCADE


I WOULD LIKE TO THANK ALL THE FOLLOWING FOR THEIR HELP (INTENTIONAL OR OTHERWISE) ON THIS SERIES: ALL AT A&B, ALL AT THE KODAK PHOT DEPT. THE 2 DAVES (HALLBERRY AND REEDER), THE FAMILY, FRIENDS AND AN ANONYMOUS LOT TOO. Tony Glover
TROGG
WELL, ALL GOOD THINGS COME TO AN END.... I'VE HAD A GOOD TIME AND I HOPE YOU DID TOO AT SOME POINT.... SO SIT BACK AND READ THE LAST ONE. ENJOY IT... - CIAO.
MR. TROGG?....
THEN HE WOKE UP....
AND IT WAS ALL A DREAM....
MR. TROGG SIR?....SIR?
ER, YES?..
ER... THERE'S A MR D. REEDER HERE TO SEE YOU SIR.....
NAHH.
SIR?
YES, SEND HIM UP.
ALL OF THOSE ADVENTURES! HA HA HA! NOTHING BUT A DREAM AFTER ALL.... OH WELL, IT'S GOOD TO BE BACK....
EDITOR OF A&B
AH! THAT MUST BE THAT NEW MAN FOR THE ARCADE.
COME RIGHT IN DAVE.....
THE END
Tony Glover 1988

arcade alley

Galaforce 2 – The Alien's Revenge. Swirling formations of the alien ships spitting electric death (or something thereabouts).

Shark – A good game with some nice scrolling effects game of the month deservedly so.



Repton Thro Time – An old age Repton does battle with everyday objects – cute but insubstantial.

Repton Thru Time – We find our cute green lizard in the midst of scrolls, scorpions and the Sphinx.

Galaforce 2 again, the sprite movement is some of the fastest we have seen (and that includes Atari ST, Amiga and Archimedes) – Phew!

Repton Thru Time – A Space-Age Repton dons his space suit and exposes himself to the perils of off-world living.

Yes, I know I've already looked at this but it seems that some of you can't cope with all these previews – you insist on reviews as well.

Nobody more insistent than ASL's MD, Peter Calver, panting at the leash for the chance to blazon *'Arcade Game of the Month'* all over the packaging to this game. Not that I mind – this is really enjoyable and I've been returning to it again and again since I first saw it. Perhaps software houses should treat reviewers the way film companies treat movie critics. You know – *Stunning gameplay – Dave Reeder, The Arcade. Can I go home now? – Clive Grace, A&B Computing.*

Enough of this. What about the game? Well, what can I tell you? How about this – Sam Inglis has come up with a real cracker. This is the game that should have been *Stryker's Run 2* in the same way that *Saigon* from Tynesoft should have been *Commando 2*. Not to deny the talents of Arcade chums Chamberlain and Edmondson who did produce Superior's sequel to *Stryker's Run* – an imaginative arcade adventure that lost its appeal for me in direct proportion to the changes they had to make to their original, more imaginative, non-Stryker game.

What the game does offer is the kind of linear progression that Stryker's Run featured – left to right across numerous scrolling screens to clear a level, all the time shooting enemy soldiers, tanks and helicopters. And, yes, the helicopters are easier to shoot down than in the earlier game. In fact, a lot of stuff is easier to shoot – partly because the animation seems smoother and more fluid, partly because you can leap up the screen as well as into trees, onto roofs, amongst scaffolding.

Some enemy soldiers leave behind their backpacks when shot – collect these for extra bonus features: more fire power, higher leaps, etc. And you'll need those because, at the end of each level, is a particularly unpleasant flying saucer that takes some destroying. Why should there be a flying saucer amongst normal soldiers, lorries and helicopters? Don't ask, just enjoy.

Some of you will complain that there's nothing new here, that the gameplay is too similar to other games. So what? It's still excellently coded, great fun to play and will repay much effort in exploring the later levels. I like it very much – I suspect you will too.

Repton Thru Time

Superior Software/Acornsoft
Model B/Master/Compact/Electron
Tape/disc £6.95/£7.95/ £9.95

Graphics/sound 9 Playability 8 Originality 5 Options editor Value for money 8 Lifespan 7 Overall 7

After more than 100,000 previous *Repton* games have been snapped up by eager games players, here's more of the same. Claims from Superior of the hardest puzzles yet in the series can be judged by you, but a dazzling finale is offered if you complete these 40 screens. And, if you find the "almost impossible to complete" screens too much, then I guess you can always seek solace in your authorised Repton Cuddly Toy – prime candidate for this year's Tacky Tie-in Award.

Don't get me wrong – I love that mischievous lizard as much as the next games player, but after Repton mugs, badges and pens do we really need a cuddly toy? Interesting too is the downgrading of the ubiquitous Superior competition – gone are the days of the expensive prizes, now we're reduced to a cuddly Egyptian Repton. Yes, well.

The problem with the game is that we've all seen it before – too often. As much as I enjoy the Repton series, it has by now run seriously out of steam and Superior seem to acknowledge as much by their cheaper pricing levels.

More of the same? Yes, another 40 screens – this time designed by Impact Games Club's Mark Botterill with coding by Matthew Atkinson. For variety this time, you get to race Repton around screens depicting prehistory, ancient Egypt, Victorian London, today and the far future. As in previous reworkings of *Repton 3*, each new screen set has new designs for the more familiar boulders, diamonds, monsters and spirits. The theory, though, is the same as ever – clear screens of diamonds, kill monsters, avoid getting trapped. The new screen designs are cunning, devious even, but it will be fanatical lizard fans who persevere, I think.

As for me, I enjoyed them but return more often to the first two releases in the series – a bit more freshness about them, even granted the time since initial release. I also get annoyed at sloppiness – this one still has the option screen from Repton 3 complete with out of date copyright notice. Doesn't anyone spot these things? Still, if you want new Repton screens and haven't yet picked up a Repton editor (easy to use and great fun) then the new low price on this could decide you. I just wonder why Superior don't call on all that Repton mania and release screens designed by users, at budget prices. Guess who's not getting a cuddly Egyptian Repton, then?

Bolo Preview

To Cambridge, one dank and clammy Saturday to meet up with Delos D. Harriman, known to you as author of the excellent conversion *Joust* or *Skirmish* (depending on which release you have) and now known to me as someone else. Yes, it was a pseudonym all the time.

One problem with the day, however – results of various Finals had been gloriously celebrated the night before and, after seemingly endless bodies were prised off Delos' floor, into their clothes and sent out into the drizzle, we settled down to talk about the game.

One grand build up later, we set out for the Computing Laboratory (did I mention that Delos just got a First in Computer Science?) to find eight BBCs linked by cables (it could have been double the number but let's not get out of control), sixteen student hands ready above keyboards and then – wham! Here's *Bolo!*

The game is hard to picture, but try. It's an arcade/strategy game, set on an island. The aim? Kill everyone and take over. Sounds simple? That's where you're dead wrong – up to fifteen other people are trying to do the same thing, although you can form alliances. The stunning thing about the game is that it is spread over all the monitor screens – what you see on your own screen is just part of a larger campaign and you're only conscious of other players when they are in the same part of the island as you.

Unless they're shielded by trees, in which case they're invisible until they shoot you off the map. Each player controls a tank (one starting position) and can rapidly get control of pill-boxes – these can be positioned anywhere and will fire at all unfriendly forces. Your other weapons are mines that can be scattered.

The basic strategy is a bit like the board game *Risk* – take control of an easily defended area and build your empire outwards. The defences are fun, too – you can construct walls, lay tarmac, all sorts. Weapon refills are available, terrain can be explored (even the lakes that can be traversed slowly) and despair can set in when destruction restarts you in the initial position – likely by now to be heavily booby-trapped.

Games can take hours. Alliances form (tanks close to one another can 'make friends'). A waiting game can take over. It is, in short, wonderful – completely unlike anything I've seen for the home micro. Remember, even *Double Phantom*, that linked two Beebs, had little visual detail. Bolo

is crammed with it and the update of each screen is virtually instantaneous.

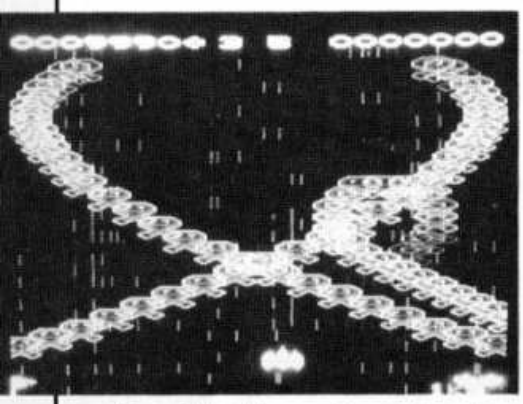
One major problem lies ahead, though. How on earth do you market a game that relies on a number of Beebs being together to play? One solution being discussed by Delos and Darryl Still of Go-Dax, who hopes to have a full demo up and running at the PCW Show, is to release the game across a number of formats – link up Spectrums, C64s, Beebs, whatever and you increase the chances of people actually being able to sit down and play the game with friends.

Perhaps we talk about major software advances too often – the hype factor. However, Bolo is one game that deserves study and praise for its technical achievement. The wonder is, that Delos has also managed to produce an extremely playable game. Clever people, these Cambridge undergraduates!

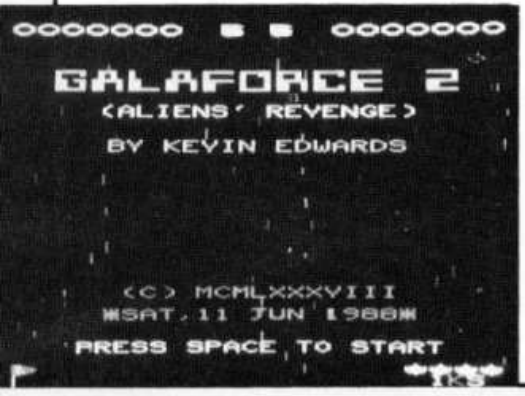
Preview Time, Exclusive

Hah, here's one that will knock your socks off and have my fellow Beeb reviewers seething with envy – Kevin Edwards' sequel to *Galaforce*, called (with some inevitability), *Galaforce 2*.

It's a cracker! Everything the earlier Superior release was, and more – more aliens more patterns, more speed, more features, more pure fun. Basically the game is, I suppose, a completely rewritten version of Galaforce in Mode 5; the extra memory gained being used for extra features, although there is a curious alternative version in Mode 1 – remember *Spy Hunter* had a similar dual option?



Faster? No, it's mega-faster – how about 70% faster? Gulp! There is a two player option, there is a hidden cheat mode (a first for an Edwards' game), there are twice as many patterns in 16 zones, there are lots of new aliens including what Kevin charmingly calls "some really nasty ones", there are smoother scrolling stars, there is a second ship bonus available (remember *Zalaga*?), there is auto repeat firing, there is a neat screen edge clipping sprite routine allowing aliens to move off the screen byte by byte, there are no homing bombs, there is a lot of fun here.



The greatest change is, I guess, the introduction of bonuses which appear when some aliens are shot, floating down the screen to be picked up by you. Some of these are nice, some not so nice – reverse controls is a bitch! The bonuses are awarded at random, although rapid fire power is the most common. Rather like *Arkanoid*, it is a gamble whether to collect these bonuses or just shoot them and go for the points.

Every 16 galaxies, you return to the start but it's harder next time. A serious omission from the earlier game has been fixed – when you restart you begin in the galaxy you were killed in. This allows you to get much further into the game and is obviously a feature that Kevin saw was successful in *Crazee Rider*.

In short, this is a wonderful shoot 'em up – fast, furious, beautifully designed and stunningly compulsive. Pray that it gets a release soon – at the time of writing Superior was considering it. The company would be crazy not to rush release it. This will be one of the top three BBC games of the year – I promise.

Go-Dax are go!

Disturbing news reaches me that Arcade chum and all-round good egg Darryl Still is about to leave Go-Dax for pastures new, after selling up to Martin Maynard of Maynard International. If you're interested in these things then that also means that they'll be a new direction for the Top Ten label as well.

Perfect timing then to announce the winner of the great Go-Dax competition. You may recall that a free Go-Dax tee-shirt was lying ready for the first Arcade reader to tell me how many colours appeared in the Go-Dax logo *That's quite enough free Go-Dax plus – Editor*. Smart arse winner Iestyn Day from Caerleon pointed out that there were seven, if you include white. See how intelligent you have to be to win competitions here?

And, on a final Go-Dax note, I still have a drawer full of yucky Bogie's Pick badges free for the asking. Anyone want a crucial piece of plastic?

Repoball – maybe

Since the end of our long *Repoball* diary by coder John Mackay, you've probably been waiting for an advance preview by your columnist.

So have I. The truth is, as soon as John finished the game he decided to (almost) completely rewrite the game – he is "really quite surprised myself how good it is," he reports one night just before midnight. Seems he's discovered this astounding new work technique – he gets up in the morning, works all day and then goes to sleep. Strange place, Glasgow!

So, next month, we should see a preview of some sort of game from John. Or not, as the case may be.

Hints 'n' Tips

A few quickies for you this month, to start you off. Did you know, for example, that if you press the keys 'SERFTGU' whilst playing Superior's *Quest*, you'll have a reincarnation option when your energy is depleted? No, neither did I, but apparently the same happens if you press 'REINCAT'.

Poke 'n' tip fans should look out for the December A&B Computing – under development now is a super special games supplement. How about some input from you, however? Would you prefer *very* complete solutions to a few games, or lots of small tips for lots of games? Write and let me know.

Want to make *Vegas Jackpot* easy? Just press SHIFT and CTRL.

Yet another *Hunkidory* cheat mode discovered – this time by Paul Sanderson of Chesterfield. Select the sound option, press CTRL and C, then press 0-9 or Q-P to start on a higher level.

Dying to jump a level in *Mr Wiz?* Just press CAPS LOCK, Q and I.

Passwords for Blue Ribbon's *Condition Red* – GEMINI, ARIANE, APOLLO, VOSTOK, ICARUS, ALTAIR, QUASAR, PULSAR, NEBULA and SIRIUS. I detect a space theme there.

Archie Tips

We don't normally get hints for Archie games sent to The Arcade, so it was good to get a note from Keith McAlpine of Birmingham about the new release *Hoverbod*, from Minerva.

Firstly, the passwords for the eight levels before the main quest. They are: MINERVAS, SIRBARRY, ZOTYBLOB, FLUMPIES, SQUIDGEE, WOBBLIES and POSSKETT.

Or, if you like short-cuts, you can use the in-built cheat level. Pressing both SHIFT keys plus Keypad / pauses the aliens, both SHIFT keys plus Keypad ★ skips the early levels and puts you right in the main game. Once there, the same keys let you use the spray can or completes the quest, respectively.

*LOADing soon

Care to hear any more about the upcoming Superior smash *Exile?* Coded by Jeremy Smith *Thrust* and Peter Irving (*Starship Command*), the game has (apparently) 200 scrolling screens, digitised sound and mega-graphics. The Model B version may be cut down from the Master release or just multi-load but each should include a map and novella, just like the packaging you'll recall with *Elite*. Apart from that, the plot sounds pretty ordinary – rescue a landing party and destroy the alien base. Still, I await it with interest.

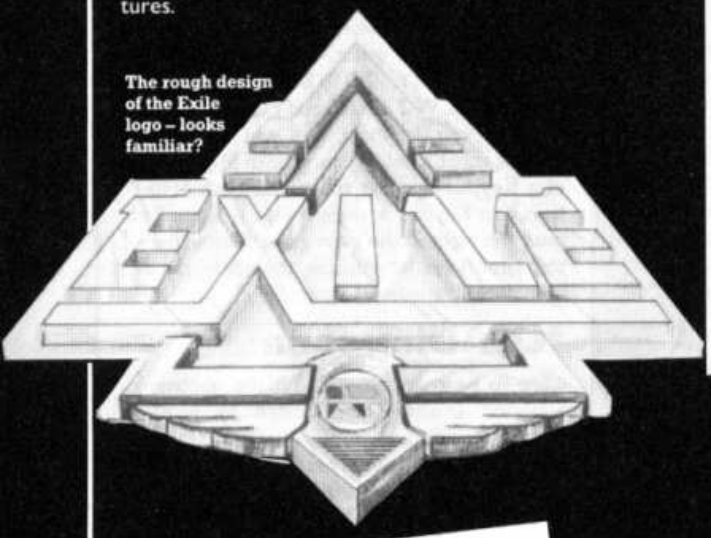
Some more Superior quickies. The eagerly expected *Pipeline* has now been delayed for redesigns, etc – the dreadful oil rig tragedy in the North Sea rendered the original game a

This is just a rough design from Superior Software's one night in Bankok – a game based on the characters and (so I understand) events in the smash hit play by Tim Rice and Bjørn and Benny of the late lamented ABBA. We're already very excited about this one lads!

little sensitive at present. Superior have acted quickly to allay any possible criticism, unfounded though that might have been. News too at last of *One Night In Bangkok*, which has been talked about for ages – it is apparently some kind of conversion of the stage musical *Chess*. As far as we can tell, Superior have the rights to that song and to 'I Know Him So Well' also. Sounds intriguing.

A short update from Audiogenic (ASL) also. Maybe out by the time you read this (maybe not) is *Breakthrough*, pencilled in for the Summer is a four game compilation of "material that hasn't already been on our compilations", as MD Peter Calver puts it – does that leave much, Peter? – and, shining like the Grail in the distant hills is *Daxis*, still "under development but with no conceivable release date". Oh, well.

A bit more news about the late-Summer Go-Dax releases *Deadenders* and *Dojo Dan – Karate Man*. Both are, apparently, adventures.

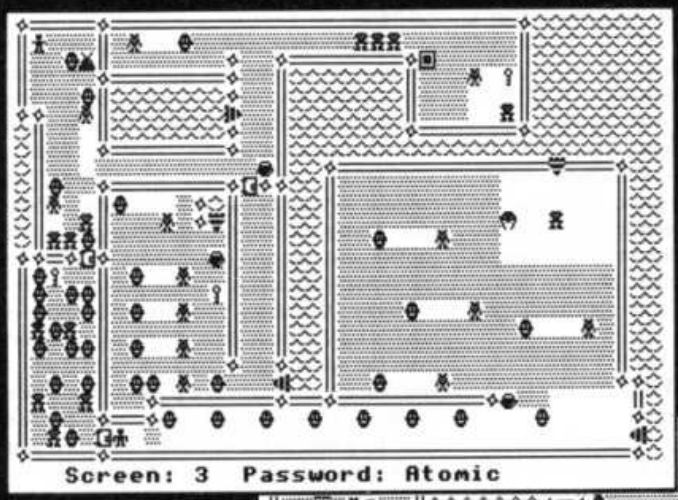


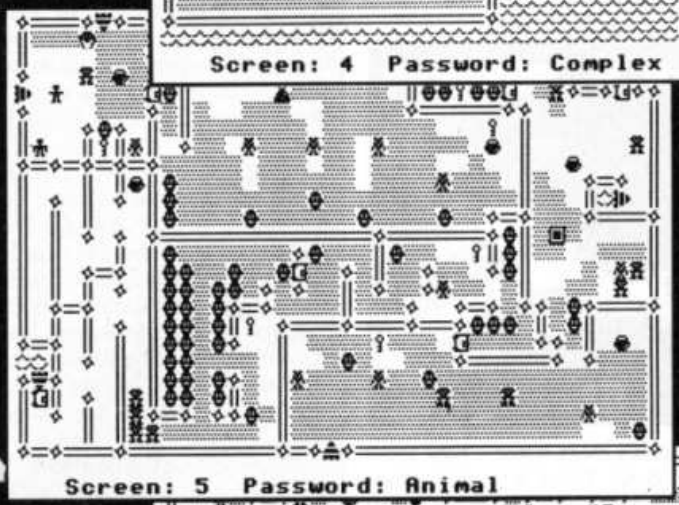
The rough design of the Exile logo – looks familiar?

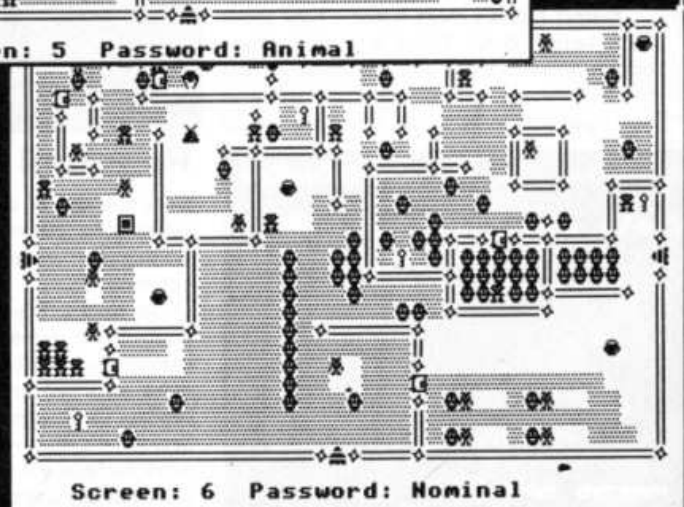
Map Time

Yes, it certainly is. It seems an age since we had some maps on this page – the main problem being, of course, their size. However, I'm told that such technical problems can be overcome, so keep your fingers crossed.

What you should find on these pages (if all goes well) are some more screens of Superior's *Bonecruncher*, from Richard Koten of Harrow. There are lots more promised including all the screens from *Plan B*, which it might be nice to get into our companion title Disk User. One day, one day.



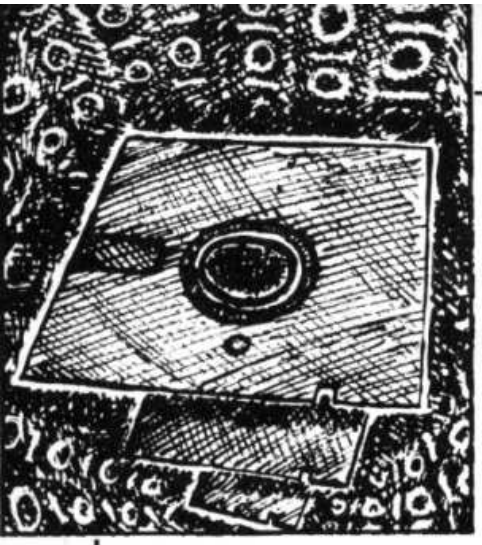




And Finally

And finally, we reach the end of the column. No witty thoughts this month, no admonitions for the general readership, no time.

But, remember, you can still write to me: **Dave Reeder, The Arcade, A&B Computing, ASP Ltd, 1 Golden Square, London W1R 3AB.**



At Last! A Master 512 Compatibility Chart

The Master 512 runs a wide range of PC software. S.M.O'Connell has sent in his table of compatibility compiled from his own tests and data from the main BBC Micro magazines. We gratefully reproduce it here but must add that no responsibility can be taken for the complete accuracy of the data. If anyone has any further information to add then would they send it to us at:
512 Club A&B Computing Number One Golden Square London W1R 3AB
and we'll include it in a future issue.

The question of MS-DOS compatibility between the Master 512 and traditional IBM-PC software has always been something of a contentious issue – we have decided to support the Master 512 and this is just the first in a series of listings of hints and tips for all you MS-DOS users out there using Acorn tackle to run PC software.

The 512 Club needs input from you however, so if you have any comments, ideas, hints, tips or even gripes, write to us – if you haven't got a Master 512, you could always enter our competition.

512 CLUB

NAME OF PACKAGE	VERSION	COMMENTS
DBase II	2.43	
DBase III	Latest	
Draw-IT	1	
Enable		
Executive Filer	1	
Executive Speller	1	
Executive Writer	1	
Flight Simulator	2.12	Version 2.13 does not run
Microtext		
GEM Diary		
Draw		
Draw Plus		
Graph		
Paint		
Wordcraft		
Desktop Publisher		
Fonts/Drivers		
Font Editor		
Wordchart		
Write		
1st Word Plus		
Programmers Toolkit		Requires Solidisk PC PLUS and DOS PLUS Vers. 2.01 (?)
Ventura Publisher		Slight Problems (ACORN)
Lattice C		
Zorland C		ACORN (Spelling Error?)
Lets C	1	
Logistics	2.1	
Microsoft Cobol	1	Does not run
Personal Editor		
PC DOS		
PC Calc		
PC Prolog		
PC Smart	2.06	Runs?
PC Boss		
PC File	4	Runs?
PC Paint		Runs?
PC Talk		
PC Paintbrush		
PC Outline	2.7	
PC Write		
PC Tools	1.12	
PC Promise		
Perfect Calc		Runs?
Perfect Filer		Runs?
Javelin		DEL key does not work
Javelin Plus	3.2	Comms do not work. W P. Tutorial freezes on required use of DEL
Multimate	1.2E	Comms do not work. Tutorial is memory resident so does not work
Ability		
Ability Plus		WP and Spreadsheet at least run
Quest		
Smart		
Smartwork		
Supercalc II	2.1	
Supercalc III		
Supecalc IV		
Turbo Graphics	3.01	
Turbo Pascal		
Turbo Reflex	1	
Turbo CAD	3	
Turbo Editor	1.3	
Twin	1	
Volkswriter 3		
Volkswriter de luxe	2	
Forms 2 Animator		
VP Planner	1	Requires loading program?
Wordstar	3.2/3.3/3.4	
Lotus 123	1.0a	Version 2 addresses disk controller directly so will not run
Psion PC-Four		Installation problem (ACORN)
Exchange		
DR C		
DR Fortran		
DR PASCAL		
DR Personal Basic		
DR RASM		
BBC BASIC (86)		
Personal Basic	2.02	
Multiplan		
Microsoft MASM		
Basic	2	
Pascal		
Fortran		
Cobol	2.01	
PC Storyboard	1.1	Camera does not work
REFLEX		
Easyflow		
IBM Assistant		
Poly Pascal		
Slidewriter plus		
Words and Figures		
SAGE Accountant		Some problems with colours (ACORN) all right on b/w?
Accountant Plus		Some problems with colours
Book keeper		Some problems with colours
Desktop		Some problems with colours
Financial Controller		Some problems with colours
PC Planner		Some problems with colours
PC Write		Some problems with colours
Word Perfect	Latest	Scroll lock does not work
Framework II		
Easywriter		
Displaywrite II		Needs installing
Displaywrite III		
Kedit		
Speller	2.5	
Data Ease		
Integrated 7	2.1	
Level 2 Cobol	Olivetti	
GW Basic		
ITT XBASIC	3.01	(Files = 20 error?)
New Word 3		
VUwriter Scientific		
HAL	4.0C	
DELTA		
Printmaster		
XTREE	1	
Fontasy		
Freelanc		
Easyflow		
Pegasus Accounts		Requires Solidisk PC Plus memory upgrade to run
G-Base		To run on version 2.01 DOS Plus (?)
Sidekick	1.12	
Promise		Does not run
Fleet Street Editor		Loads OK-hardware dependent. Does not run
Autodex		As above
Disklock		Do not run as hardware dependent
Discdump		Accesses disk controller directly so does not run
IBM PC Games		Use of undocumented system calls
Symphony		Package requires >20 files open so does not run
Rbase		Needs hardware dependent dongle
SDS-XP (Modula 2)		
VUWriter		

PRODUCT CODE NUMBERS

PROGRAM TITLE	BBC B/B+	MSTR 128	COMPACT	ELECTRON
Global View	DB01	DB16	DB33	DE06
Graphics Pack 1	DB03	DB17	DB37	DE01
Musician	DB06			
Mode 7 Utilities	DB12			
Adventurescape III	DB20	DB28	DB35	
Combat Zone	DB21	DB30	DB32	
Easy Font	DB26	DB39	DB44	
ADFS Menu		DB27	DB31	
Graphics pack 2	DB29	DB34	DB38	DE29
Colour Ikon	DB36			
A&B Bibliography	DB40	DBS3		
Bibliography Upgrade	DBS5	DBS4		
Statistics	DB41	DB42	DB43	
Home Office	DB46		DE46	
Graphics Constr. Set	DB49	DBS0	DB51	
Master Only		DBS6	DB57	
Getting Into Assembler	DB61	DB62	DB63	
Wordwise Plus	DB64	DB65	DB66	
Sideways RAM	DB67	DB68	DB69	
Pascal	DB70	DB71	DB72	
Adventure Special	DB73	DB74	DB75	
Graphics Special	DB76	DB77	DB78	
Skywatcher	DB79	DB80	DB81	
Online!	DB82			
Disk User One	DU1			
Disk User Three	DU3			

AVAILABILITY AND PRICE

ALL SOFTWARE AVAILABLE ON 80 TRACK (ADFS LARGE) FORMAT. ADFS OWNERS ENQUIRE FOR 40 TRACK AVAILABILITY.

Name	Product	Price
Global View	DB01	£10.00
ADFS	DB16	£10.00
Graphics Pack 1	DB03	£10.00
ADFS	DB17	£10.00
Musician	DB06	£8.00
Mode 7 Utilities	DB12	£8.00
Adventurescape III	DB20	£15.00
ADFS	DB28	£15.00
Combat Zone	DB21	£8.00
ADFS	DB30	£8.00
Easy Font	DB26	£10.00
ADFS	DB39	£10.00
ADFS Menu	DB27	£12.00
Graphics pack 2	DB29	£10.00
ADFS	DB34	£10.00
Colour Ikon	DB36	£8.00
A&B Bibliography	DB40	£15.00
ADFS	DBS3	£15.00
Statistics	DB41	£10.00
ADFS	DB42	£10.00
Home Office	DB46	£10.00
Graphics Construction Set	DB49	£10.00
ADFS	DBS0	£10.00
Bibliography Upgrade	DBS5	£6.00
Master Only ADFS	DBS6	£8.00
A&B '87	DBS8	£8.00
ADFS	DBS9	£8.00
Getting Into Assembler	DB61	£10.00
ADFS	DB62	£10.00
Getting Into Wordwise Plus	DB64	£10.00
ADFS	DB65	£10.00
Getting Into Sideways RAM	DB67	£10.00
ADFS	DB68	£10.00
Getting Into Pascal	DB70	£10.00
ADFS	DB71	£10.00
Adventure Special	DB73	£22.00
ADFS	DB74	£22.00
Graphics Special	DB76	£22.00
ADFS	DB77	£22.00
Skywatcher	DB79	£8.00
ADFS	DB80	£8.00
Online!	DB82	£10.00
Disk User One	DU1	£4.00
Disk User Three	DU3	£4.00

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SOFTWARE

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CHECK WITH THE TABLES TO SEE IF OUR SOFTWARE IS AVAILABLE FOR YOUR COMPUTER. PLEASE INDICATE YOUR REQUIRED PRODUCT NAME, NUMBER AND TRACK FORMAT IN THE ORDER FORM

Software is only available on the formats recorded in the tables.

All prices include VAT and postage and packing. Please make cheques/postal orders payable to Arqus Specialist Publications Ltd and print your name and address clearly on the back of your cheque. Telephone orders are taken for Visa and Access. All software is sent first class. Prices include postage and packing for European destinations. Please include £1.00 postage and packing (airmail) for other overseas order. Please allow 28 days for delivery.

ORDER FORM

PRODUCT NAME	PRODUCT NUMBER	DISC Please specify 40 or 80 track	QUANTITY	PRICE
			TOTAL	

Name.....

Address.....

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Postcode

Signed.....

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Date.....

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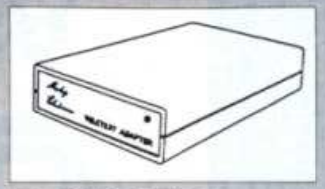
I enclose a cheque/postal order made payable to **ASP** for £.....

Please complete the form in block capitals and send it with your remittance to Software Sale, Reader Services, 9 Hall Road, Maylands Wood Estate, Hemel Hempstead, Herts HP2 7BH. Tel: 0442 41221. You can direct technical enquiries about software to Phoenix Software on 0733 53355.

TELETEXT ADAPTER

Would you like access to free high quality software and over a thousand pages of information, but Prestel access charges and phone bills too expensive? Then read on!
The answer is Teletext. Yes the same system everyone has seen incorporated into television sets, but with a difference. When Teletext is read by a computer you can actually use the data.
The MORLEY TELETEXT ADAPTER introduces you to the world of Teletext at a price that won't break the bank. Inside it you will find the latest in second generation Teletext chip technology, which unlike our rivals who are still using chips designed more than ten years ago, will be fully compatible with any future advances in the Teletext system.
With the Morley adapter you will get a state of the art unit that automatically tunes itself into the required station (no more messing around with screwdrivers or twiddling little knobs in the back of the case), a user friendly menu driven program, easy to follow instructions and a 12 month warranty. Add to this the free downloadable telesoftware and we are sure that you will agree that we are offering you one of the best bargains on the market today.

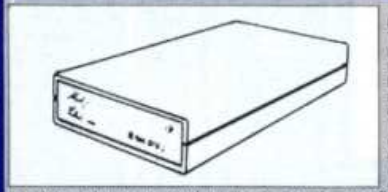
FEATURES:
* Advanced design uses the latest technology, will handle ANY future enhancements to the Teletext system e.g.: full field; 8 bit data transfer; 2k pages etc.
* Simply plugs into the user port.
* Low power consumption, less than 200ma. Optional power supply available.
* User friendly menu driven software including extended OSCLI and OSWord commands for access from BASIC programs.
* Supplied with 16k ATS (Advanced Teletext Software) and 16k support ROM software inc. printer dumps, page spoolers etc.
* FREE Telesoftware, no access charges (updated weekly).
* Save selected pages to disc/tape for later retrieval.
* Full access to all Teletext services and channels e.g.: CEEFAX, ORACLE, 4-TEL.
* Gives you a real-time clock at your disposal (*TIME).
* Software upgrades to allow for any enhancements to the Teletext service, e.g.: extra channels, full field data on cable & satellite systems etc. (only the media charge).
* Easy to follow comprehensive user guides.
* No hardware limitations, it can for example receive virtually unlimited numbers of channels.
* Usis disc available including printer drivers allows pages to be selected and dumped direct to a printer



(no more TV or Radio Times to buy).

WHAT THE REVIEWERS SAID:
". . .In terms of price, performance, future expansion possibilities and those little touches that show thought for the end user I would recommend the Morley unit."–*(Acorn User, January, 1986).*
". . .The Morley unit has been designed to ensure that its operation is simple and smooth. It is the ideal Teletext adapter for school use."–*(A&B Computing, June, 1986).*
". . .Using it over a number of months in different schools, it has proved utterly reliable, and may confidently be recommended."–*(The Times Educational Supplement, September, 1986).*
THIS IS THE BIGGEST SELLING TELETEXT ADAPTER CURRENTLY IN PRODUCTION WORLDWIDE, AND COMES WITH A FULL MONEY BACK SATISFACTION GUARANTEE.

RAMDISC



Now available! The first true MEGA capacity RAMdisc for the BBC, BBC B+ and MASTER computers. This fully compatible unit, currently available in either 1 or 2 megabyte versions comes complete with operating software on ROM, power supply, and a comprehensive user guide.

FEATURES:
One megabyte of RAM connected to the 1mHz bus. Used with the supplied ROM software programs and files may be saved and loaded from the RAMdisc in the same manner as from a floppy disc with a large increase of speed, for example, a 20k mode 0 screen takes about 3-4 seconds to load from disc and about 0.2-0.3 seconds to load from the RAMdisc. The RAMdisc ROM operates as a utility ROM working with the current filing system rather than as a separate filing system. Therefore ensures compatibility with any Acorn compatible DFS (not ADFS). The RAMdisc can be selected by a * command to take the place of any drive number from 0 to 9. If the RAMdisc replaces a floppy drive as 0 for example, all commands addressed to drive 0 will be intercepted by the RAMdisc. The default drive number is 4. Any 'Dangerous' *commands such as *COMPACT, *COPY, *BACKUP etc can be intercepted and the BBC's RAM from page 2 to &7FFF saved to RAMdisc workspace, and may be recovered using a *command. This prevents accidental corruption of any programs/data in RAM you may have been using at the time. The filing system wedge ROM supplied supports load/save, byte file access, all relevant OSFSC commands, and contains a formatter verifier and 'sector' editor for use with the RAMdisc. Catalogue structure allows up to 2,688 files.
Well that's the spec., add to this our usual 12 month no quibble guarantee and we're sure you'll agree the Morley RAMdisc is the sensible alternative if increased storage capacity and speed is your requirement.

EPROM PROGRAMMER V2

The MORLEY EPROM PROGRAMMER V2 is a small self contained unit that plugs into the BBC or MASTER user port. It comes with a high quality ZIF (zero insertion force socket) and contrasting plastic case. Also included in the package is it's own user friendly menu driven software on ROM or disc.
This state of the art unit, allows programming of 2764 (8k), 27128 (16k), and 27256 (32k) EPROMS. Not only does the hardware allow programming of the usual NMOS devices, but will handle the new generation CMOS equally as well, and with the average time taken to program a 16k at less than 30 seconds we believe it to be one of the fastest programmers available today.

THE HARDWARE
The Unit is completely under software control, there are no knobs or switches to baffle the novice, and the extended features provided should excite the pro's.

THE SOFTWARE
The comprehensive user friendly software included in the package has two main parts, the first allows EPROMS to be read, programmed, verified and edited, also allowing a ROM image to be loaded or saved to disc. The second is a full ROM management system in its own right, which has a host of useful features and routines, such as KILL and RESURRECT ROM to disable or enable a sideways ROM, dump ROM image to buffer or disc, move ROM image in buffer to sideways RAM, and VIEW-SEARCH any sideways ROM.
The whole system is available now for less than the price of one WORDWISE chip. So get yourself the all new MORLEY EPROM PROGRAMMER V2 today and start using those expansion boards for what they were made for! ROMS.
Immediate delivery no quibble 12 month guarantee.

MASTER CARTRIDGES

DUALS – Designed and manufactured by Care Electronics to Acorn specifications. These high quality Master expansion cartridges will take two 16k sideways ROM's, and will, unlike similar cartridges available from other manufacturers, accept the new second generation programs, such as Computer Concepts Interword and Spellmaster ROM's.
QUADS – As Duals but take 4 × 16 Eprom.
These Cartridges come in a high quality, robust, formed-plastic case, that fits neatly into either one of the of Master's cartridge slots.

MASTER SMART CARTRIDGE

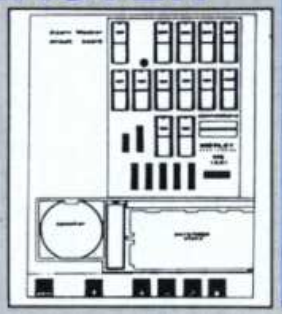
This device was designed and manufactured jointly by Morley and Care Electronics.
The **Smart** cartridge will at the press of a button halt any program running in memory and execute any one of a host of useful built in, or user defined procedures, and once completed will return to the program and continue where it left off. The only limiting factor with this device is the programmers imagination.
The **Smart** cartridge will prove useful to the novice, allowing him to do the simple things like dump any screen to printer, and made backups of protected tape or disc based software, but has an open ended specification for the advanced 'HACKER' allowing advanced programming techniques to be incorporated into almost any program at the touch of a button.

BUILT IN FEATURES (at the press of a button)
Autosaves computer's entire memory.
Freeze program at any point.
Screen dump (any mode) to printer or disc.
Allows any OSCLI command without disturbing memory.
Copies 90% of protected software.
Tape to disc, disc to tape.
User friendly menu.
Sound On/Off.

ALL CARTRIDGES COME WITH A 12 MONTH NO QUIBBLE WARRANTY

NEW PRODUCT

MORLEY MASTER BOARD 'AA'



At long last the add-on all MASTER users have been waiting for, an internal ROM board.

No more need to turn the computer off to insert the cartridge containing the ROM you need to debug the program in memory.

The new **MORLEY MASTER BOARD "AA"** allows you to have up to 8x16k and 4x32k extra Roms installed inside your MASTER and still leaves the cartridge slots free. This in effect allows your MASTER to support as many as 24, 16k ROMs installed permanently, whilst retaining the standard 4 x sideways ram banks and four banks by using cartridges.

A staggering 32 ROM images installed and accessible at any time

Included in the package is a utility ROM which has many useful features such as 'FICOPY', a clever file transfer program that transfers files between DFS and ADFS formats or vice versa.

So for less than the price of four external cartridges you get a MASTER BOARD "AA" which with twice the capacity has got to be **THE** ROM expansion for the serious MASTER user.

The unit comes with the usual Morley, full no-quibble twelve months warranty, and our usual after sales service

MORLEY ELECTRONICS

Unit 3, Maurice Road Industrial Estate, Wallsend, Tyne & Wear NE28 6BY
Telephone: Tyneside (091) 2627507

Telex: 265871 A/B MONREF G (Quoting Mag 70211)

THE COMPLETE RANGE OF TELETEXT SOFTWARE from M/B SOFTWARE

***NEW . . . DESIGN 7 PLUS** – now 'the best' is even better. Held in high regard by reviewers and hundreds of satisfied owners, DESIGN 7 has been further improved, with revised keystrip & even more features. Design/load/save and MODE 7 screen with ease, up to full CEEFAX/Oracle standard. Will convert ANY MODE 7 screen to a BASIC procedure, for inclusion in your own programs. ROM version includes a file copier, printer dumps useable from BASIC etc. B/MASTER/COMPACT.

TELETEXT EMULATORS/SCREEN DISPLAYS/INFORMATION SYSTEMS – A complete range of teletext programs to cater for all needs, with full teletext adapter interfacing.

***NEW . . . DESFAX** – totally new version – streets ahead of the competition – run your own information/display system. Stores hundreds of screens on dual 80 track drives (96 screens on single-sided 40 track), with access to any screen with a SINGLE KEYPRESS. Lots of special effects – screens can scroll, slide, overwrite etc. Animation, loops, subroutines – send for details – not enough space here to even begin to describe the advanced features!! B/MASTER/COMPACT

***NEW . . . MASTERFAX** – 84 MODE 7 screens in memory at once. 148 screens possible with cartridge RAM. An advanced teletext/carousel program featuring SINGLE KEYPRESS or 3-digit page selection. Runs entirely from memory – no disc accesses after pages are loaded. Superb animation and other effects. MASTER/COMPACT only.

***NEW . . . VU-FAX** – 1000 screens and no disc accesses! Screens stored on MORLEY 1MByte RAM DISC. SINGLE KEYPRESS gives instant access to any screen (or emulate teletext). This is the ultimate MODE 7 screen management system – there is nothing else like it. MODEL B/MASTER 128.

***ALSO . . . MASTERcopy** – DFS/DFS, DFS/ADFS, ADFS/DFS, ADFS/ADFS file copier. Uses the MASTER 128's memory to the full to permit fast disc copying. 31 DFS files to ADFS disc in less than 2 minutes. Creates directories automatically. You will wonder how you ever managed without this program. Described by reviewers as 'unexcelled'. MASTER 128 and COMPACT's fitted with DFS ROMS.

ORDER FORM

To order simply complete and return by post enclosing your cheque/P.O. made payable to Morley Electronics, or by phone during office hours, quoting your ACCESS or VISA number.

Morley Electronics, Unit 3 Maurice Road Industrial Estate, Wallsend, Tyne & Wear NE28 6BY Telephone Tyneside (091) 2627507.
Telex: 265871 A/B MONREF G (Quoting Mag 70211)

ALL PRICES INCLUDE VAT @ 15%

		P&P	Rate
Qty. ____	Morley Teletext Adapters	119.83	(a)
Qty. ____	Morley Teletext Compact Version	138.00	(a)
Qty. ____	Optional Power Supply	10.12	(b)
Qty. ____	Teletext Utilities on disc	5.98	(c)
Qty. ____	1 Megabyte RAMdisc	199.87	(a)
Qty. ____	2 Megabyte RAMdisc	349.60	(a)
Qty. ____	Eprom Programmer V2	34.50	(b)
Qty. ____	Master ROM Boards "AA"	46.00	(b)
Qty. ____	Care Master ROM Cartridges	8.97	(b)
Qty. ____	Master Smart Cartridge	39.79	(b)
Qty. ____	Cad Calc Master Quad ROM Cartridges	14.95	(b)
Qty. ____	M/B Software Design 7+	9.89	(c)
Qty. ____	M/B Software Desfax	20.01	(c)
Qty. ____	M/B Software DesROM	12.88	(c)
Qty. ____	M/B Software Mastercopy Disc	12.88	(c)
Qty. ____	M/B Software Mastercopy ROM	14.95	(c)
Qty. ____	M/B Software Masterfax	29.90	(c)
Qty. ____	M/B Software VU-Fax System inc RAMdisc	249.78	(a)
Qty. ____	5¼" Floppy Discs × 10	8.05	(c)
Qty. ____	27128 16k CMOS EPROM	4.83	(c)
Qty. ____	Info Pack + Demo Disc of all Software	FREE	(c)

Please delete: Adapter software on **ROM/Sideways RAM format**/Software on **40/80 track disc.**

Name _____ Phone no. _____

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Please add Postage and Packing @ a=£3.00; b=£2.00; c=£1.00; d=£0.66. (When ordering more than one item, add P&P on highest rate item only).
GOVERNMENT, LOCAL AUTHORITY, AND TRADE ORDERS WELCOME. Please allow 28 days for delivery.

The Hotel California – now called Funtel now offers more facilities – but at a price.

Communicate!

Welcome to the new, improved Communications column with the infamous David Janda

David Janda

Prestel Price Increase

It had to happen. Both Prestel and Micronet raised their tariffs on July 1.

The increase is the first in three years, and is applicable to subscriptions and time charges. The annual subscription rates for residential users are:

	Previous	Current	% Increase
Prestel	£6.50	£8.00	23.0
Micronet	£10.00	£12.00	20.0
So, an annual Prestel/Micronet subscription is as follows:			
Prestel/Micronet	£66.50	£80.00	20.3

The peak rate time charge is now up by 1p to 7p per minute (up 16.6%), and the peak rate period has been extended on Saturdays from 1:00PM to 6:00PM; in other words Saturdays are treated as weekdays.

Free off-peak access has been scrapped. An off-peak charge of 1p per minute between 6:00PM-8:00AM Monday – Saturday and all day Sunday will now apply. The 1p per minute off-peak time charge is waived for Micronet subscribers between 12:00PM-8:00AM as long as they stay within the Micronet CUG. In addition, Micronet subscribers who access the *Shades*, *TeleTalk* and *InterLink* gateways will **not** incur any Prestel time charge.

Finally, Micronet subscribers who access Telecom Gold through the *InterLink* gateway will now have to pay a monthly minimum charge of £1. Previously there was no standing charge.

So what do the new tariff changes mean, and how will it affect the users? The increase in Prestel subscriptions was inevitable. Since BT was privatised Prestel have had to pay for their own networking costs and new computers such as Falcon, the new billing computer. Previously BT helped (cost wise) with maintenance and such like, but cross subsidisation is no longer allowed.

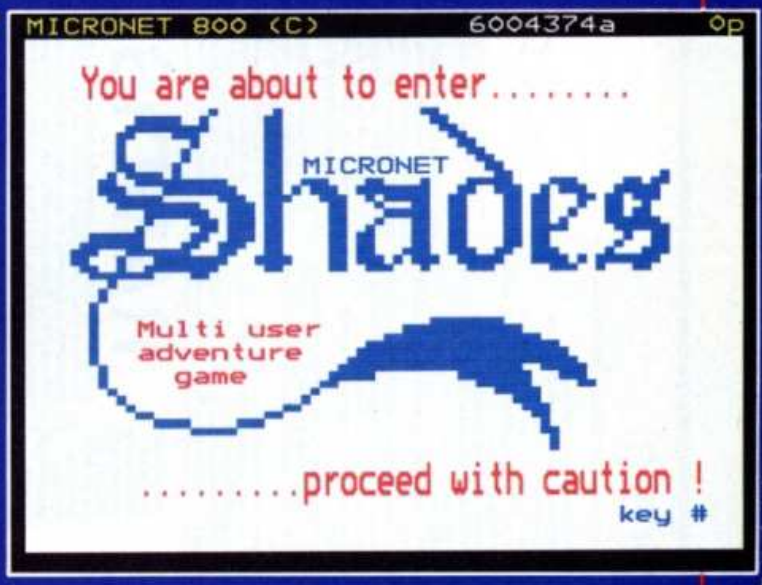
The Micronet subs increase does not come as a surprise either. Micronet are at pains to point out that development of *value added services* such as *Shades* and *TeleTalk* costs money, lots of it. Having said that, it can also be argued that the price for using these services is also a lot, and that the revenue generated from these services should greatly assist in payment for development and maintenance.

The peak-rate time charge increase should not affect the vast majority of readers who are residential and use Prestel in the evenings and at weekends. Having said that, the extension of the peak-rate period on Saturday from 1:00PM to 6:00PM is penny pinching. Prestel has done this because most travel agents (heavy users of the system) tend to stay open all day Saturday.

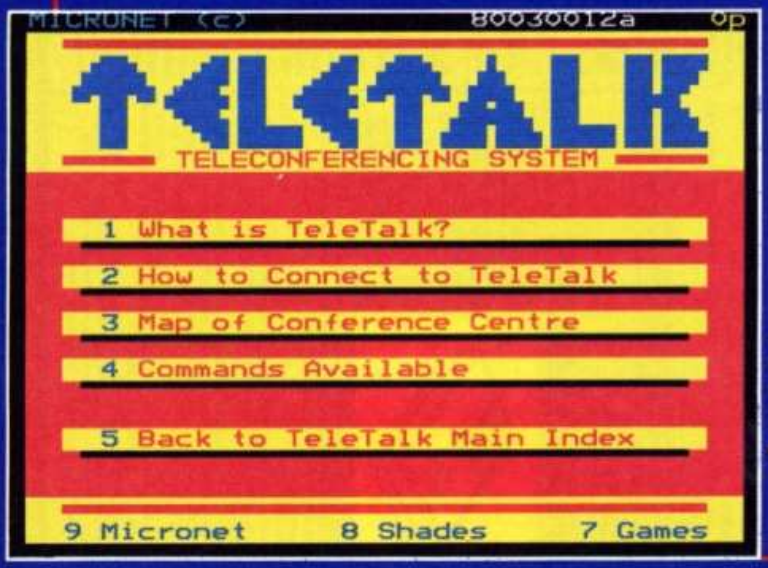
The tariff change that has caused most controversy is the scraping of free off-peak access. By doing so Prestel hope to generate revenue from residential users, who until July I have had a free ride by using the system after 6:00PM.

A 1p per minute time charge is not much, and compared to other systems such as *Telecom Gold*, *One-to-One* and others it's still the cheapest off-peak time charge going. Both Micronet and Prestel are keen to point this out but the fact is that this charge could be disastrous for Micronet.

The reasons are simple: the majority of



Shades, now on Funtel – but taking a subscription out on Micronet will make access cheaper.


MICRONET (C) 80030012a 0p
TELETALK
TELECONFERENCING SYSTEM
1 What is TeleTalk?
2 How to Connect to TeleTalk
3 Map of Conference Centre
4 Commands Available
5 Back to TeleTalk Main Index
9 Micronet 8 Shades 7 Games

Teletalk – the teleconferencing system may be up and running in the very near future.

Micronet subscribers are passive users; they do not actively contribute to the Net in terms of input. But a large number of people are dedicated enthusiasts who do use the system on a daily basis. These enthusiasts give the Net character by using its many interactive features such as the chatlines, response frames, letters sections, competitions, galleries and such like.

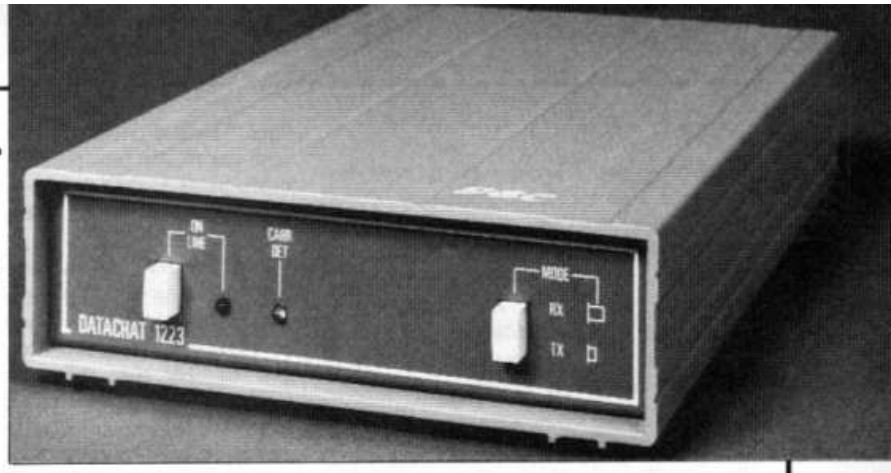
These heavy users of the system were able to take an active part simply because the system was free during off-peak times. The 1p per minute effectively doubles their Micronet costs. Before, an hour's usage at the off-peak rate would be the price of a phone call which is 44p plus VAT totaling 50.6p. Now add to this an hours time charge of 60p and the total cost of accessing the system for one hour will be £1.10.6. In other words a 118.57% increase.

Without a doubt many active users will be forced to becoming passive users. The result will be that the interactive aspects of Micronet will suffer a dramatic reduction in usage. Personally I believe there will be a significant drop in the Micronet membership in the near future.

There is a degree of hope in that the off-peak time charge is waived after midnight, but how many users (many who are young) will stay up late to take advantage of this will have to be seen. One thing is certain, mailbox, arguably the most widely used feature on Prestel will not be used as much.

Under the new tariff structure (even after 12:00PM) simply checking for new messages by going to page 930 will incur a time charge. The good news is that Prestel's new billing computer is capable of time charge billing to 100th of a minute. As a result of charging for mailbox access less correspondence will be sent. Mass mailbox sessions will be hit hard as will the many play-by-mailbox games that subscribers have set up.

Nobody can blame Prestel/Micronet for increasing their charges. They are companies that have to cover costs and make a profit. What they can be blamed for is the way they have implemented the new pricing structure, which, without a doubt will result in many people leaving the system.



The Datachat 1223 modem. Throw this little beast at a wall and the wall will probably come off worse!

Kermit the Prog!

MicroLink now has a working version of the KERMIT file transfer protocol that is compatible with CUCCA KERMIT for the Beeb. The patch was installed on the MicroLink computer shortly after the big changeover, and it's now possible to up/download ASCII and binary files to and from the system.

Binary files that are uploaded are translated to expanded hex files which can be loaded into a mail item and sent to any user, or group of users on the Dialcom system. The recipient of an expanded hex file simply downloads it as a binary file and KERMIT will do the necessary conversion from hex to binary.

MicroLink are currently in negotiations with Telecom Gold to supply FT (File Transfer) on system 72 as well. FT is best known as XMODEM and should be available across all the Telecom Gold systems "real soon now".

The ability to send/receive binary files (programs) across great distances raises the question of software piracy. It's well known that bulletin board systems have been used to download commercial programs that were uploaded by users.

However in the case of Telecom Gold a users mailbox is private and it's now technically possible to upload a program to your mailbox and send it as an Email item to a whole group of users in one go. Perhaps that's why if you want to use KERMIT on MicroLink you have to be validated, and to do so you send a mailbox to HELPLINE.

Bye Bye California!

Telemap Group Ltd, which has been running the value added service *Hotel California* has now changed the name to *Funtel*, as well as making several other changes.

According to David Rosenbaum, PR manager for Telemap, *Hotel California* was only an experiment. A very expensive experiment for the company which has splashed out on full colour ads for the service, and expensive for its users who have to pay 25p per minute for off-peak access.

The service has had its name changed to *Funtel* and the big news is that it will now have the *Shades* multi-user adventure game as its main attraction. There will also be the usual quizzes, and the teleconferencing system *TeleTalk* may also be available.

The problem with *Shades* is that it is damned addictive. And at 25p per minute for off-peak access, and 35p per minute at peak rates it will be a real pain in the wallet as well. I would suggest that if you get addicted to *Shades* then take out a subscription to Micronet/Prestel – it **will** work out cheaper.

Holes!

The security of any electronic mail system is important. I am not only talking about passwords and account numbers, but the integrity of the system itself. This cannot always be achieved with large Email systems, and when a user comes across a command, or sequence of instructions that could cause havoc to their own mailbox or anothers then you would expect the system operators to take notice when told.

Apparently not.

Whilst using Telecom Gold one evening, I accidentally (ahem!) came across the SEG command which is entered at the chevron prompt '>'. SEG, it would appear to be a segment editor, and even includes a help file (see table 2). Now with SEG you can do a number of naughty things, and even get into what looks like a monitor. Weird things have happened when I've fiddled about with it, and when reported to the appropriate people the answer I got was that it can do no harm.

So, for your enjoyment table 2 lists the SEG commands for you to see for yourself. Next month I'll report on a real hum-dinger that can mess things up good and proper. Let's hope Telecom Gold take note then.

"Click" Nothing!

No amount of moaning will change anything with regard to price increases. However, one area of complaint that is justified is the quality of service, or to be more precise the lack of it.

For some time now Prestel has been messing about with its Vascom network, which, when working will provide multi-speed access as well as an error correction protocol. As a result there have been some strange things happening when dialling Prestel. A common problem is that when dialling Prestel the call is answered but no carrier is sent. In other words a failed call. If this has happened to you then you should do the following:

1. Take a note of the time you called and the number of the Prestel node you dialled. Mailbox Prestel customer services with the above details and **Demand** a refund for the failed call.

2. Mailbox Ian Hoare on 019858957 with the facts about your failed calls. Ian edits the Amster's Cage area on Micronet, and is currently building a dossier of complaints about the level of service which he will be presenting to Prestel. Ian needs facts, not opinions, so when you mailbox him provide precise details of your failed calls.

3. If the problem of failed calls persists then write to the telephone area manager in the area where your Prestel node is situated. Explain what is going on and ask for some action to be taken.

There are problems with mailboxes as well. Too numerous to go into detail here. In my opinion, Prestel cannot be used as a viable electronic mail system.

Bits

● Its taken five years, but Beeb users now have their own chatline on Micronet. Called *Mumble Beeb* (sic) this chatline is exclusive to all Beeb users or Archie fans.

● *Tubelink*, the independant area for Beeb users on Micronet is no more. Ernest Bebbington and David Wild have taken over the area and besides a new name for the area they are also looking for ideas and suggestions. Good Luck Lads!

● Talking about the Archimedes, according to Telemap mouthpiece David Rosenbaum there are about 400 existing, or soon-to-be Archimedes subscribers on the Net. As a result the machine now has its own micro base, which according to Rosenbaum will grow with demand. Lets hope it doesn't meet the same fate as the QL database did.

● Subscribing to Micronet/Prestel for one year will entitle you to a free modem. Until now said modem was the VTX5000. That's all changed now, and subscribers signing up for a year will be given the GEC Datachat. Built like a tank it has been said that if you threw the Datachat at a wall the wall would come off worse. If you want to use the thing for comms then you'll be able to do so at 1200/75 and 75/1200 baud rates.

● Dataphone, the company that purchased the rights to the Demon modem and ZROMM comms software have discontinued the original Demon (the Demon II takes its place), and upgraded the ZROMM. The good news is that version 2.0 has a number of bug fixes. The bad news is that it's incompatible with the ACMB bulletin board software, but that's being looked into. Future updates of the ROM will include a Hayes driver and KERMIT file transfer.

● *Weatherlink* returns to MicroLink at last. New decoding software has been written for the BBC B which allows satellite pictures to be viewed in four or eight colours. You'll be glad to hear that the data files for each picture are stored in a more compact format which will reduce download time.

Archie Comms Progs

Its taken some time but there are two new communication packages available for the Archimedes. From Beebug comes a package which provides viewdata and a variety of scrolling terminal formats. Running under the Acorn WIMP environment the package also features XMODEM, YMODEM, KERMIT, SEAlink and ASCII file transfer protocols. At £69 (inc. VAT) the package is a little pricey but worth it. The viewdata editing facilities have to be seen to be believed.

From Synchrotech Software (and marketed by Dataphone Ltd) comes *Deputy*. Like the Beebug package viewdata and scrolling terminal formats are provided. Also featured is a 100 number store and XMODEM, YMODEM and ASCII file transfer protocols as well as CET telesoftware downloading.

TABLE 1 – ZROMM COMMANDS
Dataphone Zromm 2.00

ANSWER <ONOFF>	**PSS DIAL (phone no.)**
MSG <ONOFF>	**SENDASC**
BAUD <1-7>	**DLOAD <filename>**
NOVEC	**SENDCPM**
BREAK OFF	**FLOW <ONOFF>**
CARRIER ON	**SENDHEX**
CHAT	**GETASC <filename>**
PRESTEL (phone no.)	**STATUS**
CLOSE	**GETCPM <filename>**
PRETZEL	**GETHEX <filename>**
DETECT <ONOFF>	**TERMINAL (phone no.)**
	TIMEOUT <1-256>

Any command can be prefixed with a "Z" to avoid ROM clashes.

TABLE 2 – SEG HELP MENU
>SEG [SEG Rev. 19.4.4] # HELP COMMANDS ARE: R(ESUME) REST(ORE) PS(D) MA(P) – USUAL LOADER OPTIONS SA(VE) MO(DIFY) – SAME AS SAVE SH(ARE) – SPLIT OUT SEGMENTS LO(AD) VL(OAD) – SAME AS LOAD LO(AD) * – ADD TO CURRENT RUN FILE VL(OAD) * – SAME AS LOAD * TI(ME) – OF LAST SAVE DELETE VE(RSION) – OF SEG QU(IT)

Logging Off

Next month a report on the Alpha modem from Watford Electronics and a review of the MicroLink multi-speed modem. I'll also be looking at the Musictel network of bulletin boards.

Any news for me? Please feel free to contact me at A&B, or mailbox me on Prestel/Micronet 011112564, or Telecom Gold/MicroLink 72:MAG95307

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Jonathan Evans

MUSICAL TURTLES

A musical extension for the Logo computer language

Standard *Logotron Logo* provides SOUND and ENVELOPE commands that may be used in a similar way to those in BBC BASIC. However, few would regard these commands as providing a friendly or simple means of creating music in either language, so the release of a dedicated *Music disc* by Logotron is clearly a good idea in principle. Of course, you have to own the Logotron Logo ROM to make use of it. In this article, I will be looking at the facilities provided and assessing the success of the implementation.

Additional primitives

The Music disc contains a library file which can be loaded by the command USE "MUSIC. Thereafter, a considerable number of additional primitive commands specialised for music become available. These primitives are shown in Table 1, grouped according to their general function.

Annoyingly, Logotron do not provide a version of the music library that can be INSTALLed (ie loaded when something else has already been USEd) despite plenty of free space on the disc. This meant that I was unable to transfer the programs to an ADFS disc, since the use of uFIX is required to run under the latter, far superior filing system. Apart from this, I found the system fully compatible with my Master 128.

The commands provided seem to have been quite well thought out. The pleasing aspects are (a) that all musical settings can be made by the use of appropriately named commands rather than arbitrary numbers and (b) that named settings for pitch and duration are *relative* and can therefore be rescaled by global commands.

The primitives include a number of global variables such as .PITCH, DUR, OCT and VOL which hold current values, have sensible defaults and can be reset directly or indirectly by user's commands.

To play a sequence of notes you can simply enter their names: C, Eb, G etc. The notes will sound at true pitch unless transposed by the use of the SETSHIFT command. The voice number, volume and duration will be determined by current settings which can be reset as often as required. The notes also sound within the current octave which can have a value between 0 and 4 stored in OCT. Hence, if you tune goes up into a higher octave you will need to precede the notes with the command SETOCT :OCT + 1 and then return with SETOCT :OCT – 1. If you want to hear quarter tones and so on not sounded by standard notes, you can achieve this by .SETPITCH number .NOTE.

Duration settings are analogous so that you can set current values using standard musical names such as CROTCHET and MINIM or more obscurely by SETDUR number if you require other values such as dotted notes. Just as pitch settings can be transposed into other keys by use of SETSHIFT, so the tempo of tunes written can be altered instantly by SETTEMPO which globally affects all duration commands in a global way which preserves all the relative intervals correctly.

This is clearly a vast improvement on standard SOUND and ENVELOPE programming. The consequence is readable if bulky program code as in the short example listed in Table 2. In this case notes are defined by bars which are separate procedures. In more complex sample programs provided on the disc groups of bars are called by procedures defined as phrases. The master program can then very simply handle repeated sections of the music.

Another set of commands relate to the use of multiple voices. You can set volume and envelopes for different voices and switch between them. However, the system is not set up for easy programming of multi-voice music other than by use of accompanying chords. When POLY is set, rather than MONO, each note is accompanied by two others at relative intervals set by SETCHORD.

A commendable feature is the use of easy commands for preset envelopes such as PIANO and STRINGS. Self defined envelopes are also permitted by a the use of additional disc based procedures described below.

Disc files

In addition to the basic library of primitives, the Logo Music disc has a number of other files. There are several sample music programs which can be loaded and run and also listed to study the techniques used. Table 2 shows one of the simpler examples. Most of the other files on the disc are concerned with designing and saving envelopes – traditionally regarded as one of the most user hostile of all the BBC BASIC commands.

Of course, music LOGO has to work with the same basic command which is built into the BBC operating system, but Logotron have done their best to improve the interface for those who are not content to restrict their sounds to those supplied.

Typing LOAD "$.ENVS will load several procedures into memory for the purpose of designing envelopes. Essentially what these do is to prompt the user to supply each parameter value according to a relatively meaningful question such as

'What change of pitch per section .2 \ (\ –128 to 127 \ )?"

and then set the envelopes accordingly.

The file FILES also contains procedures for saving and loading envelope disc files and several files containing predefined alternative envelope sets are also provided on the disc. Once loaded into memory, these can be chosen by number using the SETENV intrinsic.

Of course, it must be said that the utilities supplied do not solve the basic problem about envelopes which is that of understanding exactly how the combination of parameters you are setting will determine the final sound quality. If the effect is not quite right you would have to go through all the prompts again as there is no edit procedure.

I suspect you would end up using the standard ENVELOPE command after all since you can test it and then edit the parameter list directly. What would improve the package greatly is a proper envelope designing utility with graphical displays and easy editing of the sort included with some of the BBC music packages, but there is nothing of this kind on the disc.

Conclusions

Music Logo provides an extension to the language which gives a facility lacking in BBC BASIC, namely that of writing music programs by use of standard musical names for notes and durations. This makes for fairly straightforward, if tedious programming. It also creates very bulky code in an environment which I have found to be already quite uneconomical in its use of memory compared with BASIC.

In fairness, Logotron have done a reasonable job given the limitations of the programming environment which are imposed primarily by the design of the BBC micro itself. I nowadays prefer to write in almost any language except BASIC – provided that I am using a more powerful computer. Having looked now in detail at several alternative languages for the BBC computers, including Logo, microPROLOG and C, I am forced to the conclusion that whilst each of these in principle has many advantage over BASIC, there is simply not enough memory available for a decent implementation which allows you to do anything very useful. My view is that BASIC and Assembler remain the only means of providing effective applications for the machine and that all other variations are 'toy' languages.

In other words languages such as Logotron Logo really have only an educational value by introducing more powerful concept such as list processing, and for serious programmers serve only to whet the appetite for what they can do on more powerful machines.

```
*** ERROR: S/* Program to read words from a file, convert to */
/* upper case and sort into alphabetical order */
/* BCPL has a routine to convert to upper case */
/* rather than the 'C' tolower routine */
/* THIS VERSION SORTS THE WORDS BY THE STRING */
/* LENGTH AND FIRST CHARACTER ONLY */
/* Re J. Evans */
NEEDS "TIME"
GET "LIBHDR"
GET "SYSHDR"
MANIFEST
$(
   NWords = 100
$)
GLOBAL
$(
   WPtrs  : 250
$)
LET START() BE
$(
   LET T1 = ?
   LET T2 = ?
   WPtrs := GETVEC(NWords + 1)
   ReadWords("S.TGHD6")
   PrintWords("Input words")
   T1 := TIME()
   ConvWords()
   SortWords()
   T2 := TIME() - T1
   IF T2 < 0 THEN
      T2 := T2 + #X8000
   PrintWords("Sorted words")
   WRITEF("Time taken %N.%N*N",T2/TICKSPERSEC,T2 REM TICKSPERSEC)
$)
AND ReadWords(FileName) BE
$(
   LET Word = VEC 20
   LET WN = 1
   LET FilePointer = ?
   FilePointer := FINDINPUT(FileName)
   SELECTINPUT(FilePointer)
   FOR WN = 1 TO NWords DO
   $(
      LET Res = 0

      WHILE Res < 1 DO
         Res := RDITEM(Word,20)
      WPtrs!WN := MAlloc(StrLen(Word) + 1)
      StrCopy(WPtrs!WN,Word)
   $)
   ENDREAD()
$)
AND PrintWords(Mess) BE
$(
   LET WN = ?
   WRITES(Mess)
   FOR WN = 1 TO NWords DO
      WRITEF("%N %S *N",WN,WPtrs!WN)
   WRITES("*N*N*N")
$)
AND ConvWords() BE
$(
   LET I = ?
   WRITES("Converting words...*N*N")
   FOR I = 1 TO NWords DO
      CvWord(WPtrs!I)
$)
AND CvWord(Ptr) BE
$(
   LET I = ?
   FOR I = 1 TO StrLen(Ptr) DO
      Ptr%I := CAPCH(Ptr%I) /* % is byte indirection */
$)
AND SortWords() BE
$(
   LET TempWord = ?
   LET WN = 1
   LET Count = 1
   WRITES("Sorting words...*N*N")
   WHILE Count > 0 DO
   $(
      Count := 0
      FOR WN = 1 TO NWords - 1 do
      $(
         IF (WPtrs!WN)!0 > (WPtrs!(WN + 1))!0 THEN
         $(
            TempWord := WPtrs!WN
            WPtrs!WN := WPtrs!(WN + 1)
            WPtrs!(WN + 1) := TempWord
            Count := 1
         $)
      $)
   $)
$)
AND StrLen(String) = VALOF
$(
   RESULTIS String%0
$)
AND MAlloc(StrLen) = VALOF
$(
   RESULTIS GETVEC((StrLen + 5) >> 1)
$)
AND StrCopy(Dest,Orig) BE
$(
   MOVEBYTE(Orig << 1,Dest << 1,StrLen(Orig) + 1)
$)
```

Table 1

Additional primitives provided by Logotron Music Logo

A. Pitch settings

A,A♭,Ab ... Gb	Names of notes with predefined pitches
OCT	Current octave setting (0 to 4)
SETOCT number	Sets octave to current number
.PITCH	Variable containing value of current pitch setting within currently set octave
.NOTE	Causes notes of currently defined pitch to sound
.SETPITCH number	Sets current pitch which can be sounded by .NOTE
SHIFT	Number added to .PITCH to cause transpositions
SETSHIFT number	Sets value of shift (default 0)

B. Voice command

SETVOICE number	Sets curent voice in range 0 to 3
VOL	Variable holding current setting of volume
SETVOL vcn voln	Sets voice number vcn to volume setting voln
CHORD list	List of two numbers for intervals of notes played in a chord
SETCHORD list	Sets value of CHORD
MONO	Causes currently selected voice to sound alone
POLY	Causes currently selected voice to sound with additional notes as set in CHORD
POLY?	Returns TRUE if POLY set, otherwise FALSE
SETENV vcn envno	Sets voice to envelope number

C. Duration comands

BREVE	Sets current duration to 64
SEMIBREVE	Sets curent duration to 32
MINIM	Sets current duration to 16
CROTCHET	Sets current duration to 8
QUAVER	Sets current duration to 4
SEMIQUAVER	Sets current duration to 2
DUR	Holds value of current duration setting
SETDUR number	Sets value of DUR
REST	Gives rest of current duration setting
TEMPO	Global variable affecting all duration commands
SETTEMPO number	Sets value of tempo to number

D. Preset envelopes

Form: NAME voicenumber
Commands: CHIMEBARS, ORGAN, PIANO, STRINGS, VIBRAPHONE

Table 2

Example of Logo Music program supplied on disc (M.LAVEND)

```
TO BAR8
MINIM DOT F
END

TO BAR7
CROTCHET A♭ A G
END

TO BAR6
BAR2
END

TO BAR5
BAR1
END

TO BAR1
CROTCHET F SETOCT OCT + 1 C C SETOCT OCT - 1
END

TO BAR2
CROTCHET SETOCT OCT + 1 C SETOCT OCT - 1
QUAVER A♭ A G F
END

TO BAR3
CROTCHET F SETOCT OCT + 1 D D SETOCT OCT - 1
END

TO BAR4
MINIM DOT SETOCT OCT + 1 D SETOCT OCT - 1
END

TO DOT
SETDUR DUR + DUR * .5
END

TO LAVENDER :N
SETOCT :N
BAR1
BAR2
BAR3
BAR4
BAR5
BAR6
BAR7
BAR8
END
```

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As part of the package (and what a package it is), if you have a BBC B, we will **also** be offering an *Acorn Universal Co-processor Adapter*, so all you need to do is plug it into your tube interface to get going.

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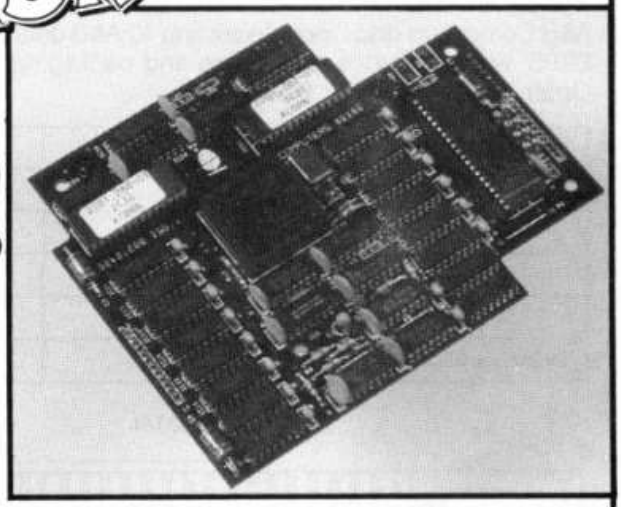
If that isn't enough, we also have *five* copies of **Mini Office II**, donated to us by Database Software, to be won for five lucky runners up – a Master 512 it isn't, but the Mini Office II software is an integrated business package featuring word processing, spreadsheet, comms, and graphics. Designed for the home office, it is rugged and reliable – a real GEM of a package (oops!).

Competition Time!



*What **You** Have To Do.*

Ten people arrive at a conference centre late one Friday night; they are booked to give five seminars the next day, but nearly all the staff have gone to bed and the booking list is sadly confused. Can you sort out who is speaking with who, at what time and on what subject?

1. *Alan* and *Anna* are speaking together.
2. *Alison* is giving the third seminar, "Inventive Expenses – using accounts packages to your advantage", at 11a.m.
3. *Anthony* is giving the last seminar, at 4p.m., "I've always wanted to write a book – and now you can, with DTP".
4. *Antonia* is talking on WP.
5. *Mr. Bowerman* is giving the fourth seminar, at 2p.m.
6. *Alec* is giving the second seminar, at 10a.m.
7. *Alfred Bright* is talking with *Alison*.
8. *Annette* is working with *Mr. Black*.
9. *Ms. Bradford* is talking on "Do you really need that secretary? – the benefits of word processing".
10. *Miss Bradshaw* is speaking earlier than *Adrienne*.
11. *Ms. Bingham* is speaking first, at 9a.m.
12. *Mrs.Bradley* is speaking on "How to make friends with your DP department".
13. *Ms. Bingham* is speaking on "Computers and the common cold".
14. *Mrs. Bradley* is speaking earlier than *Ms. Beresford*, who is speaking with *Mr. Billings*.
15. *Albert* is speaking five hours after *Mr. Brown*.
16. *Miss Bradshaw* is speaking three hours before *Mr. Bowerman*.

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A1S FAX SHEET

ViewSheet Command Mode

CREATE <n> <x> <y>
Creates a blank link file called V.VSn (for example V.VS17), must be between one and 255. The file has x columns and y rows. See also the READ and WRITE functions. (C).

ESCAPE
Switches to Sheet mode. From Sheet mode, ESCAPE returns to Command mode.

HEADINGS {ON,OFF}
Row headings and column headings can be switched on or off. Current heading status is shown with just HEADINGS. (H).

LOAD <filename>
Loads the model file, including the printer and screen window definitions saved with the model. The file must have been saved with the SAVE command. (L).

LW <filename>
Loads the window file. The file must have been saved with the SW command.

MODE <n>
Changes the screen display to mode n. Any screen window definitions are lost, but printer windows are retained. (M)

NAME <filename>
Sets the default filename, which can then be used with the SAVE command. (NA).

NEW
Clears the model and window definitions from memory, leaving a blank sheet. There is no OLD command.

PC
Prints the name of each occupied cell together with its contents. Useful only for debugging a model, or in creating a contents file for OverView.

CTRL ▲	AUTO ENTRY	DELETE COLUMN	DELETE ROW		COLUMN HEADING	ROW HEADING	PROTECT COLUMN	PROTECT ROW	RECALCULATE	JUSTIFY LABEL	DELETE SLOT
SHIFT ▲	RECALCULATE MODE	INSERT COLUMN	INSERT ROW		DELETE END OF LINE	BEGINNING OF LINE	END OF LINE	EDIT SLOT FORMAT	GO TO SLOT	INSERT CHARACTER	DELETE CHARACTER
ViewSheet	REPLICATE	EDIT WINDOW	NEXT WINDOW								

AVERAGE (list)
Gives the mean (average) value in the list. List items may be constants, cell references, ranges of cells or other functions, separated by commas. A range is taken as several separate cells, and blank cells are counted as zero values in averaging.

CHOOSE (n,list)
Chooses the nth value in the list. The list may contain constants, cell references or other functions. A range in the list such as B5B8 is taken as a single item, the sum of the four cells, not as four separate items. CHOOSE is only useful when n is a cell reference.

COL
The number of the current column. Column A is 1, column Z is 26, column IU is 255.

COS (a)
The cosine of a. Angle a must be in radians.

DEG (a)
Converts angle a from radians to degrees.

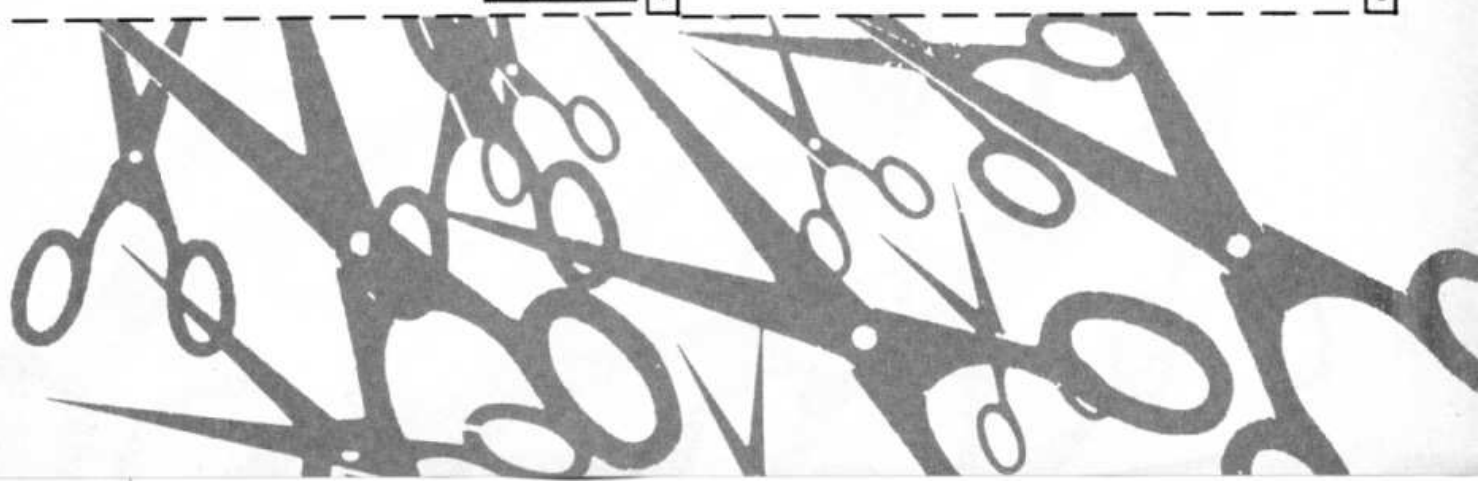
EXP (n)
Exponent of n. EXP is the inverse of LN; it converts from a natural logarithm back to a normal number.

IF (cond,out1,out2)
IF returns the value of outcome1 when the condition is true, otherwise it returns outcome2. The condition can be an expression like 'A5>10', or an ordinary number. ViewSheet takes the number zero to be FALSE, all other numbers to be TRUE. IF can be nested to simulate AND and OR.

INT (n)
The whole number part of n.

LN (n)
Gives the natural (base e) logarithm of n. See EXP.

LOG (n)
Gives the ordinary (base 10) logarithm of n. There is no anti-log function; the function '10^n' should be used.



LOOKUP (n,cr,rr)
Searches the compare range (cr) for the value n. When n is found, LOOKUP returns the matching value in the result range (rr). Used for things like price lists and looking up values in tables.

MAX (list)
The highest value in the list. The list may be made up of constants, cell references, other functions or ranges, separated by commas. A range is taken as separate cells, not as the sum of the range.

MIN (list
The lowest value of the items in the list, as with MAX.

PI
3.141596253 (π)

RAD (a)
Converts the angle from degrees to radians. 'COS(RAD (45))' is the cosine of 45 degrees – remember ViewSheet trigonometry functions require all angles in radians.

READ (n,x,y)
Reads the value from column x, row y of the link file V.VSn. See WRITE.

ROW
The number of the current row.

SGN (n)
Gives zero if n is zero, one if n is positive, and minus one if n is negative.

SIN (a)
The sine of the angle a (in radians).

SQR (n)
Square root of n (n must be positive),

TAN (a)
Tangent of a. The angle must be in radians.

WRITE (n,x,y,z)
Writes to value z to the link file V.VSn, in column x, row y.

group 1 –,()
Unary minus, brackets.

PRINT
Prints the model, using any printer window definitions if they are set. (P).

PRINTER <filename>
Loads a VIEW family printer driver. The driver is used with the PC and PRINT commands. Individual printer windows can be printed using underline and bold effects. (PRINTE).

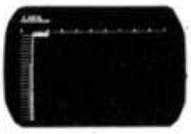
PROTECT {ON,OFF}
PROTECT disables or re-enables the protection preventing rows and columns being deleted. (PRO).

SAVE <filename>
Saves the model and window definitions in the specified file. If no filename is given, then the default name set with the NAME command is used. (S).

SCREEN
Displays the mdoel on screen, using the printer windows. Useful for previewing a model before printing. (SC).

SW <filename>
Saves the printer and screen window definitions in the file.

ViewSheet Sheet Mode



ABS (n)
The absolute value of n. ABS (n) is always positive, even if n is negative.

ACS (n)
Arc-cosine. Gives the angle of which n is the cosine, in radians.

ASN (n)
Arcsine. Returns the angle in radians of which n is the sine.

ATN (n)
The arctangent of n gives the angle of which n is the tangent.

group 2 ^
Power.

group 3 *,/
Multiply, divide.

group 4 +,−
Add, subtract.

group 5 =,<>
Equal, not equal
>, >=greater, greater or equal=
<, <=less, less or equal.

Format (Fmt) F,Dn
Floating or fixed decimal point. With D, n gives the number of decimal places to be displayed.

R, L
Right or left justification of numbers. Text labels can only be changed using SHIFT-f8, the JUSTIFY LABEL function.

M, B
Negative numbers shown with a minus sign or within brackets. M is more familiar, but B is often used for financial calculations.

Options C
Bar chart shows cell contents as row of asterisks.

H
Horizontal scrolling linked to other windows (screen windows only).

O
Switch window off.

S
Switch left side border off.

T
Switch top border orr.

V
Vertical scrolling linked to other windows (screen windows only).

1, 2
Highlight one or two, underline or bold (printer window only).

5

No sheet
Probably the sheet has been corrupted by an unsafe *command.

Out of range
The number can't be larger than 255. Alternatively, the link file has fewer rows and columns than specified in READ or WRITE.

Overflow
The expression is too complex.

Propagated
Cell reference to a cell containing an error.

Protected
Protection must be switched off before a whole row or column can be deleted, or before a cell in a protected row or column can be edited.

Range
Something wrong with a range specification.

Syntax?
A valid command but with the wrong syntax in Command mode.

Too big
The expression uses a number that is more than 1.7E38, the largest number ViewSheet can use.

Too few arguments
Not enough information supplied to READ, WRITE or the conditional functions IF, CHOOSE and LOOKUP.

Too long
The longest line ViewSheet can accept is 191 characters.

Too many files
Only five link files can be used with one model, or 10 with ADFS.

−ve root
SQR must have a positive number.

%
The value is too large to show in the column width using the current format. It's shown in full in the status area when the cell cursor is on the cell.

7

PRINTER <filename>
Loads a printer driver. The driver can be used to allow the use of highlights or special characters in reports, for example. PRINTE).

SF <name>
Saves the current database format in the specified file, using the F prefix if appropriate.

UTILITY CONVERT
Utility to change the order of fields in the database, insert more space for records, purge deleted records, etc. (U CONVERT).

UTILITY INDEX
Builds or rebuilds the index file on some specified field. (U INDEX).

UTILITY LINK
Writes data from the database records to a ViewSheet link file. (U LINK).

UTILITY MACRO
Writes data from the database records to a VIEW macro file. (U MACRO).

UTILITY REPORT
Prints or displays a report, if necessary using a report definition file. (U REPORT).

UTILITY SELECT
Makes a selection file containing just a part of the overall database. The selection file can then be sorted and used with most of the other utilities. (U SELECT).

UTILITY SETUP
Utility to set up a fresh database, or create a new report definition. (U SETUP).

ViewStore Error Messages

Bad date
The date doesn't match the dd/mm/yy form required (mm/dd/yy for American dates), or the day of the month doesn't exist.

9

?Error
Error in the cell contents. The full error message appears in the status area when the cell cursor is on the cell.

ViewStore Command Mode

ESCAPE
Switches to either Card or Spreadsheet mode, providing a database is loaded. From either data mode, ESCAPE returns to Command mode and saves any changes made to the database.

LF <name>
Loads the specified new format for the database. The name can be a complete filename, or a part-name to which the F prefix is added automatically.

LIST
Lists on screen the fieldnames used by the database. (LI).

LOAD <name> {<name>}
Loads the database. A single name can specify both data and format files using the D and F prefixes. For example, 'LOAD CREDIT' could load :0.D.CREDIT and :2.F.CREDIT. Alternatively, separate complete names can be used for the files. (L).

MODE <n>
Changes the screen mode. (M).

NEW
Restarts ViewStore. There is never any need to save data before typing NEW.

PREFIX {<l> <prefix>}
Used to set the five prefix strings – D, F, I, S and U. These prefixes are added to filenames before loading and saving files. PREFIX without parameters displays the five current prefixes. (PRE).

8

ViewSheet Error Messages

Bad file
The file is not a ViewSheet file. LOAD can only load files saved with the SAVE command, and LW only loads SW files.

Bad heading
The heading already exists elsewhere.

Brackets
Brackets must be matched in pairs in expressions.

Command?
An invalid command in Command mode.

Divide by 0
The expression involves dividing by zero.

Edge
The model may extend only to row 255, column IU. Replication would involve cells beyond the limit.

FS error
Some filing system problem prevents WRITE or READ working.

Log range
Logarithms of negative numbers aren't possible.

LOOKUP
ViewSheet failed to find a value in the compare range. Something must match the selection value exactly. Alternatively, the result range is shorter than the compare range.

Memory
The model has run out of memory.

No file
The link file can't be found. Check that it is on the disc.

Not enough memory
The model is too big for the screen mode.

6

Bad directory
ViewStore expects files to be in the correct directory, for example format files in the F directory. Check the prefixes are correct for each type of file.

Bad drive
usually this means a dot left off the end of a prefix string.

Bad expression
An invalid expression in a report definition. Check the list of database fieldnames, and also that there are delimiters around all names containing wildcards in the report field list.

Bad field
The field doesn't exist. Try LIST to check all the fieldnames.

Bad FS
ViewStore doesn't work with tape.

Bad macro
Only two letter names are possible.

Bad mode
Mode requires a sensible number.

Bad name
The filename isn't valid. Check the prefixes all end in a dot.

Bad pointer
The index file needs rebuilding.

Bad prefix
Only D, F, I, S and U prefixes can be set.

Bad record size
Record size requires a sensible number, possibly with a +.

Bad register
Only A: to Z: are available. R: and P: shouldn't be used as they are reserved for the record and page numbers.

Bad selection
Selections must consist of fieldnames, operators and values. The valid operators include brackets, AND and OR.

10

Bad string
The index name in the database format is invalid.

Brackets
Brackets must be balanced in expressions.

Can't extend
A file has grown too big.

Channel
Go to Command mode, type NEW and reload the database.

Data screen only
Spreadsheet or Card mode only.

Disc full
A file has grown too big.

Divide by 0
The REPORT definition contains an expression that involves dividing by zero. This is commonly due to dividing by a numeric field which is left blank for some records.

Editing no file
Load a database before leaving Command mode.

End
The beginning or the end of the database.

Escape
Escape.

Field is not numeric
LINK files can only carry numerical information.

Field not found
The field doesn't exist. Try LIST to check the current fieldnames.

File exists
Files of the same name already exist. Either delete the existing format and data files, or pick a new name for the new database to setup..

File more than ...
The link file is beyond the maximum size possible.

11

Maximum is 4/9 indexes
There can only be four updateable index files with DFS and Network, or nine with ADFS. Remember some can be made read-only by putting R instead of Y in the record format.

Memory full
The utility needs more memory. Change to a lower resolution mode; in most cases mode 6 is adequate, extreme cases may need mode 7.

Mistake
An invalid command in Command mode.

No data
Probably the database in memory has been corrupted by an unsafe star command – type NEW and reload the database.

No database loaded
All the utilities need the database loaded first (except for SETUP).

No end marker
The database file is corrupt. Make a copy of the back-up file and use that. If there is no backup, then the IMPORT utility may be able to read most or all of the file.

No fields
At least one field must have a name before using Card mode.

No fields found
The printer width must be larger than the width of the first field. Either reduce the width of the field, or specify a wider printer width.

No index
Y or R (for updateable or read-only), must be set in the database format for the field.

No index field
There are no indexes – the database can only be sorted by entry.

No records found
The selection criteria are not met by any fields in the database.

13

Value not in list
The value is not in the value list.

IMMEDIATE COMMANDS

Function Key	
F0	Format block
F1	Top of text in memory
F2	Bottom of text in memory
F3	Delete to end of line
F4	Move to beginning of line
F5	Move to end of line
F6	Insert line
F7	Delete line
F8	Insert character
F9	Delete character
SHIFT F0	Move block of text
SHIFT F1	Swap case of character at cursor
SHIFT F2	Release margins
SHIFT F3	Delete up to character
SHIFT F4	Start/end Highlight 1
SHIFT F5	Start/end Highlight 2
SHIFT F6	Go to marker
SHIFT F7	Set marker
SHIFT F8	Edit Stored Command
SHIFT F9	Delete Stored Command
CTRL F0	Delete block
CTRL F1	Next match for search or replace
CTRL F2	Toggle Format mode
CTRL F3	Toggle justify mode
CTRL F4	Toggle Insert mode
CTRL F5	Copy default ruler to current line
CTRL F6	Split line at cursor
SHIFT F7	Concatenate lines
SHIFT F8	Mark line as ruler
left arrow	Move left one character
right arrow	Move right one character
up arrow	Move up one line
down arrow	Move down one line
SHIFT left arrow	Move to beginning of last word
SHIFT right arrow	Move to beginning of next word
SHIFT up arrow	Move screen one page up
SHIFT down arrow	Move screen one page down
COPY	Copy block
SHIFT COPY	Copy current ruler to current line
ESCAPE	Toggle Text and Command Modes
DELETE	Delete last character typed
TAB	Insert a TAB and move to next stop

15

Not enough fields
There are too few patterns in Half1 and Half2 to match the number of items in the field list.

Not numeric
Numeric fields can only hold numbers.

Overflow
A number or result in an expression is either too big or too small.

Read error
The file is corrupt. Make a copy of the back-up of the file, and use thet. If using a floppy disc, treat it as suspect, and copy the database onto a more reliable disc.

Record too big
ViewStore can't read the next record because there isn't enough memory left. Change to a more frugal screen mode to increase the free space, or reduce the capacity figure in the database header.

Sheet display
Card mode only.

Stack overflow
The expression is too complex. This also occurs with the INDEX utility, when building an index for a field which is already sorted. Make sure the selection file is unsorted before using it with INDEX.

Too long
A filename can't be more than 12 characters. This can be a problem with ADFS – either use a different prefix, or use wildcards in the filename, for example 'VST*.CREDIT'.

Too many files
There can only be four updateable index files with DFS and network, or nine with ADFS.

Too many places
The precision is limited to the number of decimal places specified in the record format.

Type mismatch
Arithmetic can only be performed on numeric data.

14

File not wide enough
Not enough columns in the link file for the number of fields used.

Filename not found
ViewStore can't find the file. This may be because it doesn't exist, or because the PREFIX is causing ViewStore to look in the wrong directory or on the wrong drive.

File not open
A file can't be opened. Return to Command mode and reload the database.

File open
A file has been left open. Try typing NEW or *CLOSE, then reload the database.

Fixed format
The report definition format file is normally un-editable.

Index: bad filename
The index filename in the record format is invalid. Also check the I prefix is correct.

Index: file not open
The index file doesn't exist, or the I prefix is wrong.

Index: can't extend
The index file doesn't have any room to grow on the disc. It must be deleted then rebuilt using the INDEX utility.

Index: not found
ViewStore can't find the index file. Check the name in the database.

Key too long
The sorting criteria are too complex.

Keysize should be ...
Use a reasonable key width for the index.

Locked
The database and format files should not be locked. Unlock them with *ACCESS, and try again.

Limit error
The value is outside the specified limits.

12

STORED COMMANDS

Command	Function
CE	centre line
RJ	right justify line
DH	define header
DF	define footer
HE	headers on/off
FO	footers on/off
DM	define macro
EM	end macro
SR	set number register
PE	page eject (conditional)
OP	eject to odd numbered page (unconditional)
EP	eject to even numbered page (unconditional)
TM	top margin
BM	bottom margin
HM	header margin
FM	footer margin
LM	left margin
PL	page length
LS	line spacing
TS	two-sided on/off
HT	set highlight codes
CO	comment line

COMMAND MODE COMMANDS

Command	Abb	Function
SEARCH	S	search for strings
CHANGE	C	change all strings
REPLACE	R	conditionally change all strings
SCREEN		dummy print run on screen
PRINT	P	print document
SHEETS		print document with pause after each page
READ		read in file and insert at marker
WRITE		write out file between two markers
LOAD		load in file. Will only load whole file
SAVE		save whole file
EDIT		start editing a file in file mode
MORE	M	save current edit buffer and read in more of input file
FINISH	F	finish editing current file
QUIT		abandon editing current file
MODE		change screen mode
FIELD		set field character
FORMAT		format text between two markers
PRINTER		load new printer drivers
MICROSPACE		enable microspacing
COUNT		count words
CLEAR		clear markers 1 & 2
WILD		set search wild characters
NEW		clear out edit buffer
OLD		revert to old text after BREAK

CONTROL ▶	DELETE BLOCK	NEXT MATCH	FORMAT MODE	JUSTIFY MODE	INSERT MODE	DEFAULT RULER	SPLIT LINE	CONCATENATE LINES	MARK AS RULER	
SHIFT ▶	MOVE BLOCK	SWAP CASE	RELEASE MARGINS	DELETE UP TO CHARACTER	HIGHLIGHT 1	HIGHLIGHT 2	GO TO MARKER	SET MARKER	EDIT COMMAND	DELETE COMMAND
	FORMAT BLOCK	TOP OF TEXT	BOTTOM OF TEXT	DELETE END OF LINE	BEGINNING OF LINE	END OF LINE	INSERT LINE	DELETE LINE	INSERT CHARACTER	DELETE CHARACTER

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A&B COMPUTING BACK PAGE

Bryan Ralph

Technology has created an age of instant relics. Today's new computer is tomorrow's dinosaur. Yesterday's new computer is the day after tomorrow's amoeba climbing out of the primeval gloop. But don't despair if your computer is more than a few weeks old. There's no need to panic and throw it away – because a fortune is lurking in those moribund circuits. You may not think to look at them but today's humble home micros are the antiques of the future.

Abacus has evidence that groups of maverick historians, industrial archaeologists, antique dealers and crazed museum curators are fighting a fierce battle to win control of the artefacts of the age of home computing – and there may not be enough history to go round. Abacus has compiled an in-depth secret dossier on the activities of these vigilante groups who are taking history into their own hands.

1. The Floppy Plaque Guild

This secret society works only at nights and is dedicated to putting up plaques in the shape of floppy discs on the houses of computer programmers. Speed is vital in their work and they have adopted the motto 'Immortality while you wait!' Such is the secrecy of their work that they tie socks around their hammers to muffle the sound. Abacus talked to one of their victims.

2. The Buy and Destroy Syndicate

The only hurdle preventing your computer becoming a valuable antique is that there are an awful lot of them about. Help is at hand, however as a group of forward looking antique traders are acquiring huge numbers of computers and melting them down to up the price on the stockpiles they already have. This is good news – unless they get their hands on your micro. Whatever you do don't sell but persuade all your friends to sell to antique traders with on-site crusher units. You could even set yourself up as a Buy and Destroy merchant yourself and a hundred years from now when you sell your computer for a small fortune you'll be laughing.

3. The Living Museum of The Computing Arts

In a few months time a totally new concept in conservation opens its doors. The Living Museum of the Computing Arts is committed to preserving exactly what it was like to be a games programmer in the 80s. Disguised as a computer journalist Abacus obtained a preview of the museum with a guided tour given by the curator, Eric Fossil. "What we didn't want," said Eric, as we walked around, "was a stuffy old museum that nobody would come and see. Of course we had to have all the really dull exhibits like computers, mice and Iron Maiden teeshirts. But this is the kind of exhibit in which we pride ourselves," he said, pointing to a darkened room. Eric spoke in hushed tones, "What we have done here is created an exact replica of Rick Bogley's basement flat. Rick, as you know was the author of Die or be Killed, the immensely violent computer game." Eric turned the light up slightly. "How did you get it to look so authentic," I marvelled, surveying the domestic carnage. "Well actually it *is* Rick's flat. A representative of the Museum offered him £20 for it during a late night drinking session. Rather fond of the old real ale is Rick." "So where does Rick live now?" I asked. "Ah well, there's the twist. Either at his mums or when he has a little too much of the old real ale he blunders in here. It must be some sort of homing instinct and we are hoping that he and the other computer programmers we've made homeless will move in permanently here when we open. Now let's see", said Eric, turning up the lights even further, "if we are really lucky . . . yes there he is." Eric pointed to the comatose figure of Rick Bogley curled up around the base of a washbasin. "Now that," said Eric in an awed whisper, "is what I call living history."

4. The Edible History Association

This organisation is not only interested in computing – its aim is to collect edible artefacts that may have had a bearing on world history. These morsels of memorabilia can take many forms but pride of place in their collection is the half-eaten Vesta Beef Curry that many believe inspired Rick Bogley to write Die or be Killed. The Living Museum of Computing Arts are contesting custody of the beef curry.

Mind the Gap Sarah!!!

By Gorgon Vogon

Well, well, well who do we have here? Our Advertisers know her (and no doubt recognise both the outfit and the pose!). Yes, it's A&B's dearly departed Ad Manager and part-time Catwoman, Sarah Musgrave in a somewhat playful mood after hearing the news that London Transport want her talents on a full time basis. We're not quite sure which ticket barrier she'll be collecting from but rest assured the whip will be ready for anyone without a valid ticket. That should bring the fare dodger rate up eh fellas?

STOP PRESS....

The Back Page can now reveal (as can Sarah) the shocking truth that Ms. Musgrave has, in fact, not gone off to the dizzy heights of London Trainspot (!!) but has, in fact, gone off to train animals in her own "special" way – you know what I mean!

Superior software showing off their new range of Barbarian Tea-towels?

Freshly Baked...

Radical new developments have been made in the computer industry last month when bakers in South London finally perfected the ready-cut 3½" floppy disc.

"Ideal for both toasting and sandwiches, these constitute only 500 Kilobytes to your calorie kilobyte diet" senior baker at Acorn bakeries told the back page. "We are hoping to sell two varieties, one with games as various toppings, and the other containing more stodgy material such as databases and word processors."

Acorn bakeries warned us of the damages that cooking standard 3½" discs can inflict – "they taste awful", they said.

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The screen pictures show the BBC Micro version of the game.

THE CHARACTER EDITOR

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